DOCUMENT RESUME

ED 176 368 EA 012 071

AUTHOR	Chambers, Jay G.
TITLE	The Development of a Cost of Education Index: Some Empirical Estimates and Policy Issues.
INSTITUTION	Stanford Univ., Calif. Center for Educational Research at Stanford.
SPONS AGENCY	California State Dept. of Education, Sacramento.; Education Commission of the States, Denver, Colo.; National Inst. of Education (DHEW), Washington, D.C.
REPORT NO	CERAS-79-B11
PUB DATE	Aug 79
NOTE	60p.; Tables may not reproduce clearly
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Cost Indexes; Equalization Aid; Fuel Consumption; *School District Spending; Seniority; Student Transportation; Teacher Salaries
IDENTIFIERS	California; *Cost of Education Index

ABSTRACT

This paper outlines an approach for adjusting state aid for differences in educational costs. The approach focuses on determinants of the variation in the prices of school inputs such as cost of heating fuel, ability of the area to attract teachers, and needs for student transportation. The system attempts to isolate that component of the variation in input prices that is outside the control of local school districts. In addition to outlining this alternative approach, the paper reports on the empirical results of applying the approach to California school districts, and it presents a discussion of the uses and potential misuses of a cost of education index, the effects of bargaining on the estimates of the cost index, and the relation of teacher seniority costs to education cost differences. (Author/JM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED176368

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Center for Educational Research at Stanford

Institute for Research on Educational Finance and Governance

SCHOOL OF EDUCATION STANFORD UNIVERSITY

EA 012 071

Program Report No. 79-B11

THE DEVELOPMENT OF A COST OF EDUCATION INDEX: SOME EMPIRICAL ESTIMATES AND POLICY ISSUES

Jay G. Chambers*

August 1979

*The author is Associate Director and Senior Research Economist, Institute for Research on Educational Finance and Governance, Stanford University.

This paper is a summary of a study entitled,"Educational Cost Differentials Across School Districts in California " which was prepared under a subcontract to the Education Commission of the States for the School Finance Equalization Project of the California State Department of Education. The analysis and conclusions expressed in this paper do not necessarily reflect the views or policies of the California State Department of Education or the Institute for Research on Educational Finance and Governance, Stanford University.

Copies of the full report may be obtained from the author at a charge of $5.00 to cover the costs of reproduction and mailing.

THE INSTITUTE FOR RESEARCH ON EDUCATIONAL FINANCE AND GOVERNANCE

The Institute for Research on Educational Finance and Governance is a Research and Development Center of the National Institute of Education funded under the provisions of Title IV of the Elementary and Secondary Education Act of 1965. The Institute is administered through the School of Education at Stanford University and is located in the Center for Educational Research at Stanford. The research activity of the Institute is divided into the following program areas: finance and economics; politics and law; organizational sociology; concepts of equity; and historical studies. In addition, there are a number of other projects and programs in the finance and governance area that are sponsored by private foundations and government agencies outside of the special R&D Center relation with NIE.

THE DEVELOPMENT OF A COST OF EDUCATION INDEX:
SOME EMPIRICAL ESTIMATES AND POLICY ISSUES

Abstract

The major focus of the school finance reform movement has been on the reduction or elimination of the relationship between school spending and the wealth of local public school districts. However, it soon became apparent to the reformers that even if school spending were equalized across all school districts within a state, that inequities would remain in the system due to the differences in pupil need and the variations in the prices paid for school inputs across local school systems. Differences in pupil needs have been handled for the most part by the development of pupil weighting schemes or other methods of directing categorical funds to specific student populations. The State of Florida has attempted to adjust for input price differences by adjusting state aid distributions for differences in the cost of living across local school districts.

The present paper outlines an alternative approach to that used in Florida for adjusting state aid for differences in educational costs. The approach focuses on the determinants of the variation in the prices of school inputs and isolates that component of the variation in input prices which is outside the control of local school districts. In addition to outlining this alternative approach, this paper reports on the empirical results of applying the approach to California school districts, and it presents a discussion of the uses and potential misuses of a cost of education index, the effects of bargaining on the estimates of the cost index, and the relation of teacher seniority costs to education cost differences.

ACKNOWLEDGEMENTS

I would like to thank Henry M. Levin for helpful comments which contributed importantly to the revision of this manuscript. I would also like to express my appreciation to Phillip E. Vincent, Lora Rice, Gwendolyn Mitchell, and Thomasene Warledo of the Education Commission of the States for their assistance in assembling the samples of school personnel. I am deeply grateful for the significant commitment of time and effort of Penney Jordan for her programming on the project. I am thankful to Louis Woo for his assistance in assembling and organizing the data sets and for his contribution to the analysis of energy costs. I would like to acknowledge the contributions of Laurian Whyte, Margaret Murphy, and Ellen Kehoe all of whom provided assistance at early stages of this project.

I also owe a debt of gratitude to the many individuals in the California State Department of Education and those on the Variable Cost Committee of the School Finance Equalization Project who assisted me in various ways that contributed to the completion of this project. Finally, I thank Claudette Sprague for the massive job of typing and assembling the final manuscript on which this paper is based as well as for her assistance in the preparation of the present paper.

This paper is a summary of a study entitled, "Educational Cost Differentials Across School Districts in California," which was prepared under a subcontract to the Education Commission of the States for the School Finance Equalization Project of the California State Department of Education. The analysis and conclusions expressed in this paper do not necessarily reflect the views or policies of the California State Department of Education or the Institute for Research on Educational Finance and Governance, Stanford University.

Ever since the initial Serrano decision, the main focus of school finance reform has been to improve the equity with which educational funds are distributed to local school districts. This effort has taken the form of reducing or eliminating the dependence of school spending on the wealth of local school districts.[1] In recent years policy makers have come to believe that these efforts to equalize should not be limited to improving the distribution of nominal differences in school spending, but rather should be directed toward improving the distribution of "real" educational services.[2] Indeed, from this perspective, some nominal variations in school spending may be justified on the basis of differing needs of student populations and uncontrollable variations in the prices of school resources. It is the latter issue to which this paper focuses attention.

This paper presents a particular approach to assessing and measuring the differences in the costs of educational services associated with school input price variations that are beyond the control of local decision makers. Results obtained from applying this approach to local public school districts in the state of California are reported. The product of this work is an index that may be used to adjust the distribution of state aid to local districts to reflect differences in prices of school inputs. With the advent of Proposition 13 and the concomitant pressure to equalize educational spending across local districts, the ability to adjust spending for differences in costs may well be an important component of any equitable arrangements for financing schooling.

What Do We Mean by Differences in the Costs of Education?

In order to define differences in the costs of education, one must first define what is meant by educational services. It is the difference in

expenditure required to obtain any given level of educational services that defines the difference in educational costs. Given the difficulties associated with assessing and measuring the outputs of education and of identifying and examining the relationships between school inputs and outputs, we will have to be satisfied with defining educational services in terms of the inputs to which pupils have access.[3] Therefore, differences in the costs of education can be defined in terms of the differences in expenditures necessary to provide any given number of students with the same combinations and kinds of school inputs.[4] Providing the same combinations of school inputs means that any given number of students will have access to, for example, the same numbers of teachers and other school personnel as well as to the same level of transportation (home to school and field trips), or energy services (e.g., as measured by comfort levels of heating and cooling in school buildings). Providing the same kinds of school inputs means that the particular school inputs themselves exhibit similar characteristics (e.g., teachers with similar professional experience, educational preparation, or other perceived ability traits).

A cost index for educational services may then be calculated by pricing out the same kinds and combinations of school inputs across all school districts within a particular region or state. Conceptually, this procedure is exactly the same as that used to calculate the consumer price index published by the Bureau of Labor Statistics. A standard market basket of consumer goods and services is priced out either at different points in time for a given location or at different locations for a point in time. Applying this same technique to the development of an educational cost index

simply involves using the prices of the various "kinds" of school inputs to price out a "standard market basket" of those school inputs for each district.

It should be emphasized at this point that the cost of education index outlined above takes no account of the differences in the costs of providing for the varying needs of different student populations. To deal with differences in pupil need, one would have to price out the varying kinds and combinations of school inputs required to meet the needs of different groups of pupils rather than pricing out the same market basket for all students independent of need characteristics (e.g., the physically or educationally handicapped students).[5] However, analysis of differences in educational costs associated with pupil need is beyond the scope of this paper.

Alternative Ways of Adjusting for Education Cost Differences

One method, which is currently being used in Florida and was proposed for use in Oregon, is to measure differences in the cost-of-living in local school districts (or regions) and assume that these differences approximate the differences in the costs of education.[6] The major problem with this method is that costs of living and costs of education, while related to one another, are not the same thing. First, the cost of living in a particular school district is but one component in the location and work decisions which affect the supply, and hence the salaries, of school personnel. The attractiveness of regions and/or school districts as places to live and work affects the willingness of individuals to supply teaching or any other labor services and therefore ultimately affects the salaries that have to be paid to attract certain kinds of individuals. Second, in order to provide equal purchasing power to school districts, one must price out the market basket of school

inputs purchased by these districts. Variations in a cost of living index reflect only the differences in the cost of the market basket of goods and services purchased by the average consumer, i.e., school districts do not purchase the same combination of goods and services as consumers. Thus, a cost of living index is not an appropriate method for adjusting for education cost differences.

An alternative method is to examine the sources of variations in the prices of school inputs (e.g., teachers, custodians, energy, and transportation services), isolate that portion of the price variations due to factors outside local control, and use these indices of uncontrolled variations in input prices to price out a standard market basket of school inputs. This method has been applied to data from four states (including California, Florida, Missouri, and Texas).[7] Based on a casual examination of the results in the four states for which analyses have been completed, one finds that the patterns of cost differences across different types of districts (e.g., classified according to urban, suburban, rural) are quite similar. Moreover, when the method was applied to data for two consecutive years in the study of education cost differences in the state of Missouri, the correlation between the indices was very high (.9446).[8] The consistency of estimates over time as revealed in the Missouri Study and the similarities in the patterns of cost differences across these four states tend to increase one's confidence that the results found in any one of the states for any given year are not based on spurious correlations. Rather, these results suggest that there is a consistent set of factors outside local control that affect the variations in the prices of school inputs.

Procedures for Assessing and Measuring Educational Cost Differences

The goal of the analysis of educational cost differences is to develop an index that reflects the differences in expenditure (per pupil) required for two districts facing differing prices of school inputs to provide equal levels of educational services. To carry out this analysis, one needs to make the distinction between expenditure variations that are within, as opposed to outside, the control of local decision makers. The amount and kinds of school inputs (e.g., the numbers and kinds of school personnel and the level of transportation and energy services) purchased by local school districts are matters of choice, i.e., within the control of local decision makers given limitations on availability of resources. On the other hand, the minimum cost of providing a given level of educational services is determined by sets of factors that are outside the control of these local decision makers. For example, districts located in regions exhibiting relatively high costs of living or other unattractive characteristics will have to pay relatively higher salaries to attract the same kinds of teachers as districts located in low cost regions; districts in sparsely populated areas (i.e., areas with fewer pupils per square mile) will tend to exhibit higher costs of transportation services relative to districts with high student density; and districts located in regions with cooler climates will have to use more energy to provide the same classroom temperatures as districts in warmer areas and will therefore have higher energy costs. Given these differences in costs of services, it should be evident that a dollar of educational spending in one district is likely to buy different kinds of teacher services, various levels of transportation services, and different amounts of heating and/or cooling.

The component indices. The initial phase in the development of an educational cost index involves the estimation of separate indices for each of the categories of school inputs purchased by local school districts. The categories examined in California include: (1) certificated personnel including teachers, school building level administrators (principals), and district level administrators; (2) classified personnel including instructional aides, clerical and secretarial personnel, custodial and other maintenance personnel; and (3) the nonpersonnel school inputs including energy services (gas and electricity) and transportation services (including transportation personnel).

Separate statistical analyses (i.e., multivariate regression equations) were performed to explain the variations in (1) the salaries of the various categories of certificated and classified personnel and (2) the expenditures for transporation services. The purpose of this statistical analysis is to examine all the possible systematic sources of variation in salaries and expenditures. It is important to note that some of the factors included in this analysis are within the control of the district and are not to be included in any index of cost of services. But, they are included in this analysis to insure that we are able, in the construction of indices of costs, to control for the portion of the variations in salaries and other elements of school spending that are matters of district choice. Only those factors that are beyond the control of local school district officials are ultimately included as elements in an index of educational costs.

The factors included in the overall analysis of variations in salaries of school personnel are: personal characteristics (e.g., age, experience,

education, field of study in college, sex, and race); job assignment characteristics (e.g., job title, days of work per year); and the characteristics of classrooms (e.g., background characteristics of pupils), schools (e.g., curriculum and pupil characteristics), districts (e.g., pupil achievement, age of school buildings and district size), and regions (e.g., costs of housing, percent urban population, population density, and access to urban areas).[9] Transportation services include such factors as number of pupils transported, miles traveled for field trips, number of pupils per square mile in the district, the cost of bus drivers, percent urban population in the county, and the population density in the county are included to explain variations in expenditures.[10] (Appendix A contains the parameter estimates for the personnel and transportation regression equations as well as a table listing variable names, definitions, and sources.) These explanatory variables are then divided into two categories: (1) those that are within the control and (2) those that are outside the control of local decision makers. The indices of costs of these educational resources should reflect the variations in expenditures (or salaries) associated only with factors outside local control. For example, any characteristic (such as age, experience, education, field of study, race or sex) of a teacher is within the control of the district (at least in the long run). Similarly, the number of pupils transported or numbers of miles of field trips are within district control. Calculation of the component cost indices then involves simulation of the relative variations in salaries or transportation expenditures that would exist if only the uncontrollable factors varied across school districts. Alternatively stated, the component index for teachers reveals how much more or less one district pays than another in order to be able to attract and employ teachers with similar characteristics.

For the analysis of energy cost variations an engineering approach was used. This method is based on specifying the detailed structural characteristics of the "typical" classroom school building.[11] Given these characteristics, one can then make some calculations as to the relative variations in consumption of natural gas and electricity necessary for heating and cooling this typical school building across the different climatic regions of the state. Adding to these consumption levels for heating and cooling the consumption requirements for hot water, lighting and appliances and then pricing out these energy consumption levels at existing prices of natural gas and electrictiy across the state, one can estimate an index of the variations in the cost of energy services.[12]

The Overall cost of education index (CEI). The next phase in the development of the CEI is to combine these component indices into a single index that reflects the differences in the costs of providing the same level of educational services. The technique used for accomplishing this task involves using the component cost indices for school resources to price out a standard market basket of school inputs for each district in the state.[13] Since transportation services are funded separately from the rest of educational services, a separate index is calculated for transporation. The overall index of educational services, therefore, excludes transporation costs.[14] (Appendix B describes the procedures and sets out the equations used to calculate the component and overall indices of education costs.)

The Empirical Results

Table 1 presents a summary of the descriptive statistics for the overall CEI and component indices. The mean, standard deviation, minimum and maximum are shown for all districts and for subsets of districts categorized according to city size and metropolitan/nonmetropolitan locations. This table is intended to provide some indication of the patterns of cost differences across the state of California.[15]

TABLE 1

DESCRIPTIVE STATISTICS FOR THE OVERALL COST OF EDUCATION INDEX, THE COMPONENT INDICES, AND THE TRANSPORTATION COST INDEX FOR CALIFORNIA SCHOOL DISTRICTS 1976-77

Cost Index	Descriptive Statistic	All Districts	Districts Located in Metropolitan Areas in Cities of Population: Greater Than 500,000	250,000 to 500,000	100,000 to 250,000	Less Than 100,000	Districts Located in Nonmetropolitan Areas
COST OF EDUCATION INDEX (CEI)-- (excludes transportation costs):	Mean	1.009	1.102	1.069	1.079	1.033	0.971
	Std. Dev.	0.051	0.018	0.034	0.029	0.046	0.026
	Minimum	0.892	1.082	1.030	1.020	0.932	0.892
	Maximum	1.132	1.127	1.090	1.116	1.132	1.054
	No. Dist.	1042	4	3	14	604	417
(1) Teachers' Cost Index (ITCH):	Mean	1.000	1.104	1.068	1.082	1.028	0.956
	Std. Dev.	0.057	0.011	0.040	0.026	0.050	0.032
	Minimum	0.858	1.091	1.024	1.027	0.899	0.858
	Maximum	1.118	1.118	1.100	1.106	1.114	1.049
	No. Dist.	1042	4	3	14	604	417
(2) Principals' Cost Index (IPRN):	Mean	1.000	1.241	1.231	1.221	1.028	0.916
	Std. Dev.	0.131	0.064	0.026	0.030	0.118	0.098
	Minimum	0.647	1.160	1.208	1.165	0.701	0.647
	Maximum	1.306	1.306	1.259	1.272	1.258	1.150
	No. Dist.	1042	4	3	14	604	417
(3) Administrators' Cost Index (IADM):	Mean	1.000	1.318	1.234	1.214	1.044	0.924
	Std. Dev.	0.113	0.090	0.051	0.031	0.100	0.076
	Minimum	0.718	1.220	1.181	1.149	0.786	0.718
	Maximum	1.437	1.437	1.283	1.269	1.244	1.150
	No. Dist.	1042	4	3	14	604	417
(4) Secretaries' Cost Index (ISE):	Mean	1.000	1.112	1.077	1.090	1.039	0.939
	Std. Dev.	0.088	0.020	0.069	0.069	0.084	0.050
	Minimum	0.776	1.093	0.997	0.927	0.912	0.776
	Maximum	1.232	1.138	1.119	1.144	1.232	1.133
	No. Dist.	1042	4	3	14	604	417
(5) Custodians' Cost Index (ICU):	Mean	1.000	1.132	1.068	1.059	1.019	0.969
	Std. Dev.	0.070	0.173	0.070	0.071	0.073	0.047
	Minimum	0.910	1.016	1.024	0.943	0.927	0.910
	Maximum	1.384	1.384	1.149	1.154	1.240	1.156
	No. Dist.	1042	4	3	14	604	417
(6) Instructional Aides Cost Index (IIA):	Mean	1.000	1.140	1.103	1.121	1.036	0.942
	Std. Dev.	0.079	1.066	0.070	0.067	0.077	0.031
	Minimum	0.874	1.072	1.023	0.985	0.917	0.874
	Maximum	1.200	1.200	1.155	1.188	1.200	1.105
	No. Dist.	1042	4	3	14	604	417
(7) Natural Gas Cost Index (IGAS):	Mean	1.000	0.571	0.685	0.549	0.766	1.361
	Std. Dev.	0.725	0.206	0.265	0.291	0.542	0.816
	Minimum	0.305	0.383	0.383	0.305	0.305	0.467
	Maximum	9.623	0.802	0.878	1.099	9.623	4.086
	No. Dist.	1042	4	3	14	604	417
(8) Electricity Cost Index (IELC):	Mean	1.000	0.962	0.933	0.903	0.960	1.062
	Std. Dev.	0.191	0.094	0.148	0.110	0.136	0.239
	Minimum	0.708	0.871	0.810	0.810	0.721	0.708
	Maximum	1.767	1.055	1.096	1.230	1.287	1.767
	No. Dist.	1042	4	3	14	604	417
TRANSPORTATION COST INDEX (IELC):	Mean	1.000	0.009	0.013	0.022	0.674	1.572
	Std. Dev.	2.332	0.005	0.001	0.009	1.835	2.917
	Minimum	0.003	0.003	0.012	0.012	0.012	0.028
	Maximum	23.457	0.014	0.014	0.046	23.457	19.582
	No. Dist.	916	4	3	12	551	346
Bus Drivers' Cost Index (IBD):	Mean	1.002	1.103	1.051	1.033	1.017	0.978
	Std. Dev.	0.063	0.055	0.024	0.036	0.057	0.064
	Minimum	0.852	1.048	1.024	0.964	0.913	0.852
	Maximum	1.281	1.175	1.071	1.069	1.281	1.202
	No. Dist.	1042	4	3	14	604	417

The component indices (1) through (8) for certificated and classified personnel and energy services as well as the indices for transportation services and bus drivers reflect the variations in salaries or expenditures associated with factors outside local control. For school personnel, these estimates were obtained by simulating the variations in salaries that would have been observed had each district employed similar kinds of school personnel (as reflected by the personal characteristics) and assigned them to similar kinds of assignments (as reflected by job titles, days of work, classroom and school characteristics as well as district characteristics such as age and condition of school buildings, type of district and achievement test scores of pupils). That is, these personal and assignment characteristics were hypothetically held constant across the districts. The variables actually used in the computation of the personnel cost indices include measures of district size (in terms of ADA); the cost of land and housing, the degree of urbanization, population density, and the size (population) of the county; and the distance of the county from the nearest central city of greater than 100,000 population.

Transportation costs were obtained by simulating the variations in transportation expenditures that would have been observed had each district provided the same level of services defined by the proportion of pupils transported, the proportion of those pupils living within minimum distances specified by state law, proportion of pupils transported by private carrier, miles per pupil of field trips and other non-home to school transportation services. The variables actually included in the index of transportation costs included: an index of bus drivers salaries; district size; an index of auto theft and

vandalism in the district; population density and percent urban population of the county in which the district is located; and number of pupils per square mile in the district.

The energy cost variations reflect both the differences in prices paid across the state for energy sources (natural gas and electricity) as well as the differences in consumption of energy required to achieve the comfort levels of heating and cooling.

The overall cost of education index (CEI) shown at the top of Table 1 was calculated by using the personnel and energy cost indices to price out a standard market basket of school personnel and energy services. Transportation costs were excluded from this index because transportation services happen to be funded separately from the rest of educational services in California.[16]

Because of the relative importance of school personnel in the overall budget of school districts, personnel costs tend to dominate the variations in the overall index of educational costs (the CEI). The CEI varies from a low of .892 to a high of 1.132 indicating that the lowest cost district in the state has 10.8% lower than average costs, while the highest cost district in the state incurs costs about 13.2% higher than average. Moreover, one finds that in general the metropolitan areas exhibit higher costs of education than the nonmetropolitan areas, and the large central cities tend to exhibit, on average, higher costs than smaller central cities and suburban districts.

Teacher cost differences tend to be the major driving factor of the overall differences in education costs, since teachers account for almost 60% of

school district budgets. The teacher cost index ranges from .858 to 1.118 over all school districts. The metropolitan areas of the state tend to exhibit relatively higher costs of school personnel than the nonmetropolitan areas, although certain remote areas (with low population density and only small or no urban population) tend to have relatively high personnel costs. The results of this analysis are consistent with the fact that relative to nonmetropolitan areas, the metropolitan areas and particularly the central cities exhibit higher costs of living, higher crime rates, greater air pollution and other disadvantages which appear to characterize urban life. Moreover, the metropolitan areas overall tend to reveal a more intense competition in labor markets than do nonmetropolitan areas. At the same time the higher costs in certain remote areas is consistent with the notion that individuals do place some value on access to urban areas and that this results in some difficulty in attracting personnel to school districts in remote rural areas.

The observed variation in energy costs across all districts in the state is quite substantial ranging from .305 to 9.623 for natural gas (predominantly heating) costs and from .708 to 1.767 for electricity (cooling and lighting, etc.) costs. Energy costs in general tend to be higher in the nonmetropolitan areas simply because heating costs tend to dominate the variations in energy costs and the nonmetropolitan areas tend to be located in the regions of the state suffering the coldest winter climates. The highest index of 9.623, in fact, was for the Tahoe-Truckee school district located in the Sierras with the coldest climate in the state.

Transporation costs (which are listed separately and are not included in the computation of the overall CEI) tend to be higher in the nonmetropolitan

than the metropolitan areas primarily due to the sparsity of student populations and the relatively small size of school districts. Mitigating this effect in only a small way are the higher costs of transportation personnel and the likelihood of higher insurance rates (e.g., due to higher crime rates and the greater hazzards of traffic) in the metropolitan relative to the non-metropolitan areas. The index of transportation costs varied for the vast majority of school districts between .25 and 2.0 indicating a variation in costs of anywhere from 75% below average to 100% above average costs. There are a number of districts with indices above 5.0 indicating transportation costs over 500% higher than average costs. Given the fact that the average proportion of school district budgets spent on transportation costs ranges from less than 1% to almost 30% with an average of about 5%, index numbers in the range of .01 to 5.0 are probably not all that unreasonable. However, the indices substantially above 5.0 are somewhat suspect. (The highest index in the sample was 23.457.) In at least some of these cases (if not all), the numbers may not reflect the actual average costs of services provided by the district. The districts with these high numbers tend to be among the smallest and least densely populated districts in the state. Because of the extremely high cost of providing their own services to such small pupil populations, they tend to join with other adjacent or overlapping school districts (e.g., a small elementary joining with a high school district) to provide services to a larger population of pupils with a higher overall pupil density, both of which would tend to lower the costs of providing services. Since cooperative arrangements were not recognized by our data set, we were not able to account for this possibility in estimating our transportation cost indices and therefore our estimates, in fact, for these small districts would tend

to fall outside the range of district sizes of our sample and would overstate the actual costs incurred.

How to Use the CEI

Before describing how to use the CEI, it is necessary first to describe how it perhaps should not be used. In particular, the individual indices of personnel costs should not be used by the state to adjust salary schedules themselves. Adjustment of salary schedules should be a matter of local discretion rather than a matter of determination by the state. One of the major reasons for this is that the personnel cost indices are not calculated on the basis of differences in pupil needs for different "kinds" of personnel (e.g., teachers with different personal characteristics such as ability, race, sex or age). The index only reflects an estimate of the difference in cost of employing personnel with similar characteristics. However, different districts may desire, because of differences in pupil need, to hire different kinds of teachers. Given the difficulty of establishing any uniform standards of pupil need, it is better to leave this determination of salary schedules necessary to attract the desired kinds of personnel to the discretion of the school district.

A second major reason for leaving salary schedules to local discretion is that it is not likely that the state would ever be as flexible as local school districts in adjusting to changes in local circumstances in the labor market. It would require a truly massive effort for the state to be able to monitor the changes in conditions in these labor markets in order to make the appropriate adjustments. Moreover, even if the state could monitor these local changes, bureaucratic inertia may tend to limit its flexibility in

actually making the necessary adjustments. Indeed, it is difficult enough for local decision makers to perceive labor market changes and make adjustments quickly enough. Finally, all of this ignores the increased potential inflexibility that may result from state-wide collective bargaining that may arise if salary schedules were state determined. Once salary schedules are determined by the state, they become one more device for politicians to manipulate rather than a tool which local school districts can use for the purpose of attracting appropriate school resources.

Then how should the CEI be used? Rather than adjusting salary schedules, the individual component indices should be combined into an overall CEI which may be used to adjust distributions of state aid to local school districts to reflect the differences in the costs of educational services. This allows individual districts the power to determine how to allocate their budgets among school inputs, but does account for the differences in access to "real" inputs (inputs adjusted for differences in characteristics) associated with differences in unit costs.

The notion underlying this usage of the CEI is that at the very least the state should provide equal access to real educational services, rather than simply equal dollars, to districts with identical fiscal capacity. Under a system of full state assumption of educational finance (i.e., a system in which there is, for all intents and purposes, no local component of revenue for school services), the CEI would be used to adjust the entire budget available to the district. Under alternative finance schemes which allow for some local determination, the CEI should be used to adjust only that portion of revenues derived from state sources and the method of application

should ensure that some of the burden for local cost differences is assumed by local taxpayers. The rationale for this is that any system of school finance that is based on the notion that there should be a certain amount of local determination should also ensure that any given burden of responsibility related to the provision of educational services be shared proportionately by the state and local agencies. If such adjustments are not treated in a mode of sharing, there may well be some serious equity and efficiency consequences.

In order to see how to apply the CEI, consider a hypothetical state in which the index varies, as it does in California, from .892 to 1.132. Further, assume that the average district spends $1,000 per pupil for educational services. (This example focuses attention on general educational services exclusive of special education or other educational programs for which districts receive categorical funding.) This suggests that the highest cost district in the state would have to spend $1,132 per pupil in order to provide the same level of services that the lowest cost district would spend $892 per pupil to provide.[17] Under a system of full state assumption, the state would be responsible for compensating districts for the full range of cost differences incurred. The lowest cost district would receive $892 per pupil while the highest cost district would be entitled to $1,132 per pupil.

As an alternative, suppose that the state assumed the responsibility for only $600 of the average district's expenditure of $1,000 while the local district would be responsible for the other $400.[18] Following the notion that the local district should share in the responsibility for assuming some portion of these cost differences, the state would provide $679.20 (=1.132 times $600) to the highest cost district while providing $535.20 (=.892 times $600) to the lowest cost district. The highest cost district would then be

responsible for raising the additional $452.80 (which is $52.80 more than the average cost district) necessary to achieve the $1,132 per pupil spending level. The lowest cost district would be responsible for raising $356.80 (which is $43.20 less than the average cost district) to achieve a spending level of $892. Of course, whether or not the high and low cost districts do decide to adjust their local portions of the budget to account for the cost differences is a matter of local choice.

Under the current arrangements in California for school finance developed in response to Proposition 13, there is little, if any, real local discretion left in the level of school spending, since the property tax rate is constrained at such a low level. (About the only discretion left at the local level is what proportion of the 1% property tax is used for public elementary/secondary schools versus other local public services.) One approach that the state might take in the funding of educational cost differentials under existing arrangements is as follows:

> STEP 1. Establish some level of general educational services (measured in terms of intensities of school inputs such as the kinds and quantities of different school personnel per pupil, levels of per pupil spending on instructional materials and books, etc.) that it believes should be provided to all children in the state.
>
> STEP 2. Cost these services out using the component indices of educational costs discussed previously. This will determine a dollar figure necessary for every district to pay to be able to provide the same services.
>
> STEP 3. Compute the level of spending that would occur in the district under current arrangements without any adjustment for cost differences.

Then

a. If the spending level under current arrangements is not sufficient to provide the level of services specified in Step 1 and cost it out in Step 2 above, then adjust the level of state aid in order to provide sufficient funds to compensate for excess costs;

b. If it is sufficient (i.e., if the spending figure under existing arrangements is greater than or equal to that calculated in Steps 1 and 2 above), then no additional state aid need be forthcoming.

Scaling the Index

Clearly, in redistributing school aid to local school districts according to the CEI, some districts gain and some lose relative to the current finance system. This fact only reflects the fact that the existing system does not treat districts in an equitable fashion with respect to these differences in cost. Nevertheless, the fact that there are gainers and losers in the redistribution creates a political dimension to the inclusion of the CEI into the state aid formula.

There have been two suggestions made to eliminate the loss of state aid to an individual district under the inclusion of the CEI: (1) cut off the CEI at 1:00 using only those numbers above one to adjust aid distributions and (2) shift or scale up the index so that the lowest cost district (the district with the .892) receives an index of 1.00 and the highest cost district receives an index of 1.269 (=1.132 ÷ .892). The difficulty with the first of these alternatives is that the inequity with respect to cost differences remains. Under this alternative, all districts with CEI below 1.00 would be relatively better off than the districts with indices above 1.00. The districts below 1.00 would be receiving more aid than they need to provide the same services as the average district, while the districts above one would be receiving only just enough aid to provide the same services as the average district.

The second alternative has the advantage that it maintains the relative position of all districts with respect to the cost differences while eliminating any losers when compared to the existing system of distribution. On the other hand, this would prove to be very expensive to the State, increasing state aid under a full assumption scheme by about 26.9 percent. Moreover, scaling the index upward has essentially the same effect as shifting upward the basic level of support for educational services while leaving the index alone (i.e., not rescaling the index upward). By shifting the basic level of support for education services upward and leaving the scale of the CEI unchanged, one reveals more explicitly the nature of the underlying policy change that has occurred.

Actually, both of these alternatives have significant disadvantages. The first leaves the inequities of the present system unresolved, while the second would be quite costly to the state. A preferable alternative would be for the state to select the level of services (perhaps as measured by per pupil input levels) that should be provided to the average district in the state, and then to cost out that level of services using the CEI. In order to prevent the CEI from changing (in this case increasing) the overall level of state aid for educational services, the CEI may be scaled by dividing the index for each district by the weighted average of the CEI for all districts in the state where relative district size is used as the weight. The reason for scaling the index in this fashion is that the districts with indices above one tend to be larger than those with indices below one. Without using a weighted average, the implementation of the cost index would increase the level of state aid.

How Does Teacher Bargaining Affect the CEI?

To the degree that bargaining outcomes are within the control of the local district, they should not, and are not, included in the calculation of the CEI. Indeed, no direct measure of the bargaining relationship between teacners and local districts is included in the computation of the CEI. Moreover, the results of previous work by this author suggest that the effects of teacher bargaining tend to be regionalized, i.e., within any given region there were only negligible differences (less than 1%) in teachers' salaries between bargaining and nonbargaining districts.[19] Thus, any effects of bargaining may tend to be spread more or less uniformly throughout the state of California since virtually every district in the state engages in collective bargaining.

It has been argued that there are a number of political dimensions to the bargaining process that may affect the relative bargaining strength of teachers' unions. Clearly, these political dimensions are difficult, if not impossible, to identify or measure in any systematic way. However, as long as the relative bargaining power of the teachers' unions is uncorrelated with those factors that have been included in the calculation of the teachers' cost index, then the index will not reflect differences in teacher salaries due to bargaining power. If, on the other hand, there is some correlation (not necessarily causative) between relative bargaining strength and some of the variables included in the computation of the index, then bargaining will to some degree (related to the strength of the correlation) be reflected in the teacher cost index. Of course, any variables suspected of being correlated with teacher bargaining power may be eliminated from the calculation of the teacher cost index if policy makers deem that to be appropriat

The Costs of Teacher Seniority

Because of declining enrollments and reduced rates of attrition among teachers, many districts in the state find they have a disproportionate number of highly experienced teachers. This "excess" level of seniority among teachers obviously translates into higher costs of services for local school districts. Although seniority is accounted for in the analysis of variations in teachers' salaries, the CEI as presently constructed does not account for these excess teacher costs related to seniority. The reason for excluding costs of seniority is that in the long run, district decision makers can adjust the average seniority of its staff. Any compensation for excess costs of seniority may reduce the incentives of local districts to make such adjustments.

However, were such compensation to be contemplated by state officials, there are two issues that need to be addressed. First, it will be necessary to determine the "target" levels of seniority for each district. How much seniority would the district desire if it had complete free choice? It is the difference between the actual levels and the desired or "target" levels of seniority that determine the existing level of "excess" seniority. To carry out such an analysis will require different methods of analysis than that used to construct the CEI presented in this paper. In particular, the method involves an examination of patterns of employment of new teachers across school districts as one component of estimating "target" levels of seniority.[20] Combining the estimates of "excess" seniority with information on experience increments derived from the analysis of teachers salaries outlined previously will allow policy makers to estimate the costs associated with "excess" seniority.

Second, it will be important that any compensation for excess seniority costs be phased out automatically over time. The automatic phase out of such compensation will maintain the incentive for districts to make the adjustment. The time dimension or phase out will depend on how quickly districts should be able to make the necessary staff adjustments based on expected levels of attrition and enrollment decline.

Concluding Remarks

The major purpose of this paper was to outline one approach for assessing and measuring the differences in the costs of educational services and to report the results of an application of this approach to data for the State of California. The results of the study are quite consistent with expectations about the patterns of educational cost differentials and with the results of studies conducted in other states. The range of differentials was about 25% with the larger urban districts exhibiting relatively higher costs than sub-urban districts which, on average, exhibit relatively higher costs than rural districts. The exception was in remote rural areas where some difficulties in attracting school personnel and high transportation costs tended to result in somewhat higher costs of educational services. It was also established that for the vast majority of districts, differences in educational costs were pretty much determined by differences in the costs of school personnel, since school personnel accounted for about 85% of the average school district budget.

Given the existence of these variations in educational costs, it was suggested that equity in school funding would require at least some recognition that a dollar of educational spending does not buy the same level of school services across all school districts. Indeed, there appears to be some basis

for the notion that state aid should have equal purchasing power in terms of educational services across local school districts with similar accessibility to local fiscal resources. Moreover, adjustment for education cost differences becomes more important in circumstances where the state assumes a greater proportion of the responsibility for supporting school services since localities will be less able through the adjustment of local tax rates to compensate for differences in the costs of services. Thus, where political pressures for equalization in schooling takes the form of increased state assumption of school funding or where tax limitation measures directed at local taxes place an increasing responsibility on the state for financing local public education, the ability to, and necessity for, compensating local school districts for the differences in costs of services is going to become increasingly important. In the State of California, both factors are at work.

FOOTNOTES

1. See, for example, Coons, Clune, and Sugarman, "Private Wealth and Public Education" for a major overview of the issues raised in the early court cases. For an econometric analysis, see M. Feldstein, "Wealth Neutrality and Local Choice in Public Education," American Economic Review, March 1975, pp. 75-89.

2. Two of the early references to directing school finance reform toward disparities in "real" educational services include W. Norton Grubb, "The First Round of Legislative Reforms in the Post-Serrano World", and Stephen Michelson, "What is a "Just" System for Financing Schools? An Evaluation of Alternative Reforms", both in Law and Contemporary Problems, (Duke University), Vol. XXXVIII, No. 3, Winter-Spring 1974.

3. See Harvey A. Averch, Stephen J. Carroll, Theodore S. Donaldson, Herbert J. Kiesling and John Pincus, How Effective is Schooling? Educational Technology Publications, Englewood Cliffs, N.J. for a discussion of the problems associated with studying input-output relations in education.

4. Such an index would, of course, be subject to the usual problems of index numbers outlined in standard economics textbooks. For example, see C. E. Ferguson and J. P. Gould, Microeconomic Theory, 4th edition, Richard D. Irwin, Inc. (1975) pp. 65-69.

5. Ideally, one would like to specify outcomes or other quality measures which could be used as the standard of comparison for costing out special or other categorical programs relative to regular educational programs. Since this is not so easily accomplished, one may adopt input levels as the standard for cost comparisons across school programs.

6. See Improving Education in Florida, a report by The Governor's Citizens' Committee on Education, Tallahassee, Florida, March 15, 1973, pp. 48, 87. Also, "School Finance at a Glance", a chart, prepared by the Education Commission of the States, of school finance formulas used by the 50 states.

7. The work on Missouri is reported in The Journal of Human Resources, Vol. XII, No. 4, "Educational Cost Differentials and the Allocation of State Aid for Elementary/Secondary Education," by Jay G. Chambers. The work on Florida is being done by E. Fresen of the Florida State Department of Education and the work in Texas was completed by Kathleen Adams of the Education Commission of the State.

8. Supra Note 7, Chambers (1978).

9. Data for the analysis of the variations in the salaries of certificated school personnel were derived in part from a questionnaire sent out to over 9,000 individuals employed in local public school districts in the state of California. Response rates for categories of personnel varied from just under 60% to over 75% and appeared to be exceptionally close to the actual geographic distributions of school personnel around the state. Other items of data for the statistical analyses were taken from a school district survey questionnaire, various agencies of the California State Department of Education, the Census Bureau, and the California Statistical Abstract.

   The effects of collective bargaining on teachers' salaries and implications for the measurement of teacher costs are discussed later on in this report. The analyses of classified personnel (i.e., secretaries, custodians, instructional aides and bus drivers) salaries uses the district as the unit of observation because of the lack of available data on individual classified personnel.

10. Data for the analysis on transportation expenditures were derived primarily from the J141 form required by the state, the school district questionnaire, a questionnaire sent to county school offices regarding number of square miles in school districts and a number of other sources including the Census Bureau, the California Statistical Abstract, and the Federal Bureau of Investigation Uniform Crime Reports. We were unable to obtain the square mileage data necessary to calculate student density for 126 districts and were therefore unable to carry out the statistical analysis. However, estimates of square mileage by district can, and should be, made for this purpose in order to complete the analysis.

    As part of our data collection effort we gathered information on miles of bus transportation service devoted to busing for integration. We were unable at this stage to isolate any statistically significant effect of busing for integration on cost of transportation. However, based on the responses to our questionnaires only a small number of districts were engaged in this kind of busing during the 1976-77 school year. This small sample makes the effect on costs difficult to isolate. Moreover, the districts involved tend to be the largest in the State and this leads to two additional difficulties. First, intensity of busing for integration will be correlated with factors, such as district size, already included in the analysis and hence may be already reflected to some degree, in the transporation cost index discussed subsequently in this report. Second, the large districts may suffer relatively small proportionate increases in costs of busing for integration because of the very high density of student population. Clearly, further statistical analysis will be necessary to estimate the costs associated with busing for integration.

11. For this purpose, we used the "1974 School/Classroom Specifications" developed by Ayres Associates under contract (No. 400-142) to the State of California Energy Resources Conservation and Development Commission.

12. It should be noted that this approach potentially overstates the cost differences in energy services since it does not allow for the possibility that districts in high cost regions (whether the high costs derive from climatic differences or actual differences in gas and electricity prices) may tend to invest in better insulation or other structural features designed to reduce energy consumption.

13. Note that different market baskets of school inputs were used for unified, elementary, and high school districts in order to account for the potential different mix of educational services provided according to level of instruction.

14. One should note that there is no particular reason in theory or practice that necessitates that transportation services be funded separately. One could very well include transportation costs in the overall CEI and not fund transportation separately.

15. The full report includes appendices listing the overall and component indices for each school district in the State.

16. Because not all districts in the state provide transportation services, it is not possible to calculate a transportation cost index for every district. Therefore, in reporting the results, it was decided to report the overall CEI separately from transportation costs to correspond to the funding formula existing in the State.

17. It is important to reiterate that this difference in cost does not account for differences in pupil need, scale of school or district operations, or other differentials associated with specific educational programs (e.g., vocational education). Rather, this cost index focuses only on the differences in educational costs related to the uncontrollable variations in the prices of school inputs. Other methods would have to be employed to compensate districts for cost differences based on pupil-need, scale or programmatic differences.

18. An example of a state aid formula which involves some sharing or responsibility would be a foundation program in which the amount of state support varied inversely with the level of property value per pupil. Given some variation in property values per pupil across districts, one would observe a variation in the amount of state support. In the simple example presented in the text, I have restricted attention to the average district in the state. The basic notion of sharing responsibility for differential costs could in principle be applied to any district in the state in the same way I have outlined the application for the average district.

19. See Jay G. Chambers, "The Impact of Collective Negotiations for Teachers on Resource Allocation in Public School Districts," Ph.D. dissertation, Department of Economics, Stanford University, May 1975; and "The Impact of Bargaining on the Earnings of Teachers: A Report on California and Missouri," a paper prepared for presentation at the "U.K.-U.S. Conference on Teacher Markets" held at the University of Chicago in December 1976. The Ph.D. dissertation focused on a study of bargaining in California school districts and was carried out on data for the 1970-71 school year, during which about 70% of teachers in metropolitan areas were covered by formal bargaining contracts.

20. Some research related to this issue is being carried out under the direction of this author with support from the Ford Foundation.

APPENDIX A

TABLE A-1

DETERMINANTS OF TEACHERS' SALARIES
IN CALIFORNIA SCHOOL DISTRICTS, 1977-78

[DEPENDENT VARIABLE = $\log_e$ (ANNUAL SALARY)][a]

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Tchrs' Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
(1) INTERCEPT	7.41432247	25.48241	0.0001	----	1.00000000	0.00000000
Background Characteristics:						
(2) AGE	0.00574893	2.61640	0.0089	0.58%	40.84188818	10.37920300
(3) AGE^2	-0.00004680	-1.90073	0.0575	-0.009	1775.73831347	892.96838942
(4) SEX--MALE	0.01626791	3.20736	0.0014	1.64	0.40513291	0.49103028
(5) SEX--FEMALE	----------	-------	------	----	----------	----------
(6) RACE--INDIAN	-0.05543014	-2.66294	0.0078	-5.39	0.01008249	0.09992704
(7) RACE--ASIAN	-0.02383559	-1.84425	0.0653	-2.36	0.02703941	0.16223546
(8) RACE--FILIPINO	-0.02013937	-0.62058	0.5349	-1.99	0.00412466	0.06410559
(9) RACE--BLACK	-0.00439477	-0.36199	0.7174	-0.44	0.03299725	0.17867026
(10) RACE--HISPANIC	-0.00296531	-0.29629	0.7670	-0.30	0.04812099	0.21407093
(11) RACE--WHITE	----------	-------	------	----	----------	----------
(12) SINGL, DV, SP-NC	0.00906334	1.70777	0.0878	0.91	0.21127406	0.40830593
(13) MARRIED, DV, SP-C	----------	-------	------	----	----------	----------
Educational Preparation:						
(14) DEGREE--BACHELORS	----------	-------	------	----	----------	----------
(15) DEGREE--MASTERS	0.04607008	9.21595	0.0001	4.71	0.34647113	0.47595452
(16) DEGREE--CERT ADV ST	0.03811252	2.64825	0.0082	3.88	0.02245646	0.14819661
(17) DEGREE--EDD	0.07684717	1.91839	0.0552	7.99	0.00274977	0.05237811
(18) DEGREE--PHD	0.09248219	3.00835	0.0027	9.69	0.00458295	0.06755768
(19) CERTIFIED--YES	0.02988766	3.62814	0.0003	3.03	0.87471357	0.32906833
(20) CERTIFIED--NO	----------	-------	------	----	----------	----------
(21) GRAD HRS: 0-14	-0.20561640	-11.81892	0.0001	-18.59	0.01604033	0.12565936
(22) GRAD HRS: 15-29	-0.12708644	-10.46396	0.0001	-11.93	0.03528873	0.18455092
(23) GRAD HRS: 30-44	-0.10444607	-16.11678	0.0001	-9.92	0.16452796	0.37083896
(24) GRAD HRS: 45-59	-0.04739885	-7.97147	0.0001	-4.65	0.18744271	0.39035596
(25) GRAD HRS: 60 OR MORE	----------	-------	------	----	----------	----------
(26) BA REC'D 60's--YES	0.03298161	6.91339	0.0001	3.35	0.39688359	0.48936363
(27) BA REC'D 60's--NO	----------	-------	------	----	----------	----------
(28) UG MJR--HUMANITIES	----------	-------	------	----	----------	----------
(29) UG MJR--MATH-SCI	0.01103448	1.31864	0.1874	1.11	0.09211732	0.28925779
(30) UG MJR--SOC SCI	0.00658207	1.04152	0.2978	0.66	0.22502291	0.41769314
(31) UG MJR--BUSINESS	0.00614631	0.47734	0.6332	0.62	0.03024748	0.17130680
(32) UG MJR--PHYS EDUC	0.02152210	2.40557	0.0162	2.18	0.07653529	0.26591360
(33) UG MJR--IND ARTS	0.04763150	4.02158	0.0001	4.88	0.03987168	0.19570253
(34) UG MJR--SPEC EDUC	0.02982934	1.67225	0.0946	3.03	0.01649863	0.12741217
(35) UG MJR--SEC EDUC	-0.00496842	-0.34783	0.7280	-0.50	0.02383135	0.15255845
(36) UG MJR--ELEM EDUC	-0.00365674	-0.53878	0.5901	-0.37	0.22181485	0.41556247
(37) UG MJR--FINE ARTS	-0.01024169	-0.83575	0.4034	-1.02	0.03299725	0.17867026
(38) UG MJR--MISC	-0.00867351	-0.62256	0.5336	-0.86	0.02566453	0.15816866
Professional Experiences & Assignment Characteristics:						
(39) YRS PRES DIST	0.00244951	4.04610	0.0001	0.25	12.22914757	40.08419284
(40) (YRS PRES DIST)^2	-0.00000226	-4.06231	0.0001	-0.0005	1755.55820348	42984.25748263
(41) TOTAL YRS EXPER	0.02507047	17.22368	0.0001	2.54	13.03024748	7.68147416
(42) (TOTAL YRS EXPER)^2	-0.00048852	-12.78065	0.0001	-0.10	228.76535289	251.30182815
(43) YRS UNEMPLD	-0.00039290	-0.89605	0.3703	-0.66	1.36938588	3.47851696
(44) TENURED--YES	0.06126737	7.29872	0.0001	6.32	0.87178918	0.33394774
(45) TENURED--NO	----------	-------	------	----	----------	----------
(46) JR HS TEACHER	-0.02082952	-2.60067	0.0094	-2.06	0.09349221	0.29118770
(47) ELEM/HS TEACHER	----------	-------	------	----	----------	----------
(48) SPEC EDUC TCH--YES	0.01200214	1.37052	0.1707	1.21	0.07607699	0.26518204
(49) SPEC EDUC TCH--NO	----------	-------	------	----	----------	----------

TABLE A-1 (Continued)

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Significance (4)	% Effect on Tchrs' Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
Classroom Characteristics:						
(50) % HISPANIC PUPILS	-0.00023372	-2.14485	0.0321	-0.02%	18.81245185	23.74205937
(51) % BLACK PUPILS	-0.00033147	-2.48239	0.0131	-0.03	7.81386262	17.63634571
(52) % MENTALLY GIFTED	0.00032710	1.57678	0.1150	0.03	5.57363875	10.41857281
School Characteristics:						
(53) CONT EDUC	-0.04443128	-2.41003	0.0160	-4.35	0.01329056	0.11454228
(54) ADULT EDUC	-0.04135861	-1.12366	0.2613	-4.05	0.00320807	0.05656183
(55) NONTRAD HS	0.13789695	4.16656	0.0001	14.79	0.00412466	0.06410559
(56) OTHER SCH PROG	----------	-------	------	----	----------	----------
(57) ADV CURR--YES	0.01206494	2.56621	0.0103	1.21	0.63902841	0.47414449
(58) ADV CURR--NO	----------	-------	------	----	----------	----------
(59) % NON-LIM ENGL SPG	0.00080322	2.10132	0.0357	0.08	3.69615032	6.77412978
(60) LOG_e (OTH PROF/PUP)	-0.00180370	-2.62214	0.0088	-0.002	-7.32060292	3.71460696
District Characteristics:						
(61) HS DISTRICT--YES	0.05294082	7.39374	0.0001	5.44	0.12969753	0.33604736
(62) HS DISTRICT--NO	----------	-------	------	----	----------	----------
(63) % SQ FT PRE 1949	0.00015873	1.94333	0.0521	0.016	21.12616530	33.89220133
(64) ACHV INDEX-DIST	-0.00005295	-2.63028	0.0086	-0.00005	60.57221465	106.31456728
(65) LOG_e (ADA)	0.02219492	1.81544	0.0696	0.022	9.64761849	1.57122823
(66) $[LOG_e (ADA)]^2$	-0.00081697	-1.32957	0.1838	-0.0016	95.54416189	31.72061884
County & Regional Characteristics:						
(67) LOG_e (PRICE AGRI LAND/ACRE)	0.00991935	2.13749	0.0327	0.010	7.00731387	0.68020544
(68) LOG_e (AVG PRICE NEW HOMES)	0.05015117	3.19958	0.0014	0.050	10.63523344	0.21296083
(69) PCT URBAN POP, COUNTY	-0.00436576	-4.09970	0.0001	-0.44	89.75481210	15.63138287
(70) (PCT URBAN POP, COUNTY)^2	0.00003635	4.93604	0.0001	0.007	8300.13444546	2268.58783523
(71) LOG_e (POPULATION, COUNTY)	0.20091412	4.66716	0.0001	0.201	13.88834050	1.41380244
(72) $[LOG_e (POPULATION, COUNTY)]^2$	-0.00664900	-4.50427	0.0001	-0.013	194.88391506	38.55290762
(73) LOG_e (POP DENSITY, COUNTY)	-0.06403572	-3.69734	0.0002	-0.064	5.26998552	1.53464814
(74) $[LOG_e (POP DENSITY, COUNTY)]^2$	0.00339949	2.75070	0.0060	0.007	41.66677591	17.69102684
(75) $[LOG_e (POPULATION, AREA)]^2$	-0.00085171	-3.60017	0.0003	-0.0017	209.70006919	43.08845987
(76) $[LOG_e (POP DENSITY IN AREA)]^2$	0.00306973	3.58989	0.0003	0.0061	41.27216340	15.39034116
(77) HOURS FROM CENTRAL CITY	-0.01846332	-3.43563	0.0006	-1.83	0.57546295	0.95591798
(78) (HOURS FROM CENTRAL CITY)^2	0.00294176	2.83678	0.0046	0.59	1.24451802	4.37928203

R^2 = 0.7719 F(63,2117) = 113.758 Standard Error of the Estimate = 0.09539

Sample Size = 2,182

[a]The figures presented in column 5 represent the percentage effect on teachers' salaries for the dummy variables (i.e., the variables that take on only the values of 0 or 1) and elasticities (the percent effect on the dependent variable in response to a one percent change in the explanatory variable) for the variables in LOG_e or percentage form. For all other variables, the figures in column 5 reflect the percent effect on teachers' salaries in response to a one unit change in the explanatory variable (e.g., one year of experience, one year of age, one hour of time from the central city). For the coefficients of squared variables, column 5 reflects the percent rate of change in the percent effect. For example, the percent increase in salaries in response to a one year gain in total years of experience is 2.54 percent which decreases at a rate of -0.10 percent per year.

TABLE A-2

DETERMINANTS OF PRINCIPALS' SALARIES
IN CALIFORNIA SCHOOL DISTRICTS, 1977-78

[DEPENDENT VARIABLE = $\log_e$ (ANNUAL SALARY)][a]

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Prin. Salaries[b] (5)	Mean Value (6)	Standard Deviation (7)
(1) INTERCEPT	7.18596348	17.19207	0.0001	----	1.00000000	0.00000000
Background Characteristics:						
(2) AGE	0.01661083	2.97322	0.0031	1.67%	48.91130435	6.98111895
(3) AGE2	-0.00015398	-2.62167	0.0090	-0.03	2440.96695652	662.51647060
(4) SEX--MALE	0.02587156	2.13888	0.0329	2.62	0.87652174	0.32927183
(5) SEX--FEMALE	----------	-------	------	----	----------	----------
(6) RACE--INDIAN	0.00489046	0.08357	0.9334	0.49	0.00347826	0.05892539
(7) RACE--ASIAN	-0.06865279	-1.93467	0.0536	-6.63	0.01043478	0.10170490
(8) RACE--BLACK	-0.00191309	-0.08160	0.9350	-0.19	0.02782609	0.16461751
(9) RACE--HISPANIC	0.04475264	1.97916	0.0483	4.58	0.02608696	0.15953272
(10) RACE--WHITE	----------	-------	------	----	----------	----------
Educational Preparation:						
(11) DEGREE--BACHELORS	----------	-------	------	----	----------	----------
(12) DEGREE--MASTERS	0.00331906	0.19124	0.8484	0.33	0.82608696	0.37936472
(13) DEGREE--CERT ADV ST	0.00000962	0.00037	0.9997	0.001	0.03478261	0.18338830
(14) DEGREE--EDD	0.03391202	1.43810	0.1510	3.45	0.05391304	0.22604267
(15) DEGREE--PHD	0.02336673	0.71902	0.4724	2.36	0.01739130	0.13083814
(16) GRAD HRS: LESS THAN 60	-0.01934278	-1.69572	0.0905	-1.92	0.11826087	0.32319793
(17) GRAD HRS: MORE THAN 60	----------	-------	------	----	----------	----------
(18) COL SELECT: 30 TO 39	-0.05564790	-2.01113	0.0448	-5.41	0.10260870	0.30371133
(19) COL SELECT: 40 TO 49	-0.06478519	-2.48652	0.0132	-6.27	0.27304348	0.44591091
(20) COL SELECT: 50 TO 59	-0.06133695	-2.40793	0.0164	-5.95	0.41043478	0.49234098
(21) COL SELECT: 60 TO 69	-0.06976530	-2.66309	0.0080	-6.74	0.19304348	0.39503048
(22) COL SELECT: 70 OR GREATER	----------	-------	------	----	----------	----------
(23) UG MJR--HUMANITIES	----------	-------	------	----	----------	----------
(24) UG MJR--MATH SCI	0.02903393	1.77226	0.0769	2.95	0.09043478	0.28705337
(25) UG MJR--SOC SCI	0.00528929	0.39947	0.6897	.53	0.25565217	0.43660799
(26) UG MJR--BUSINESS	0.006360065	0.36608	0.7597	.64	0.04347826	0.20410868
(27) UG MJR--PHYS EDUC	0.02250268	1.45987	0.1449	2.28	0.11652174	0.32112890
(28) UG MJR--IND ARTS	-0.01182070	-0.48256	0.6296	-1.18	0.02608696	0.15953272
(29) UG MJR--SEC EDUC	0.02449788	0.92975	0.3529	2.48	0.02260870	0.14878185
(30) UG MJR--ELEM EDUC	-0.00793946	-0.60145	0.5478	-0.79	0.33043478	0.47077923
(31) UG MJR--FINE ARTS	0.04812687	1.38264	0.1674	4.93	0.01217391	0.10975728
(32) UG MJR--MISC	0.07877956	1.27022	0.2046	8.20	0.00347826	0.05892539
(33) GRAD MJR: EDUC ADMIN	-0.00013356	-0.01052	0.9916	-0.01	0.71130435	0.45355069
(34) GRAD MJR: EDUC CURR	0.01713633	1.05161	0.2935	1.73	0.10260870	0.30371133
(35) GRAD MJR: EDUC GUID	0.01750099	0.81273	0.4167	1.77	0.03826087	0.19199240
(36) GRAD MJR: EDUC PSYC	0.00451878	0.13785	0.8904	0.45	0.01391304	0.11723213
(37) GRAD MJR: BUSINESS	0.10611523	1.14814	0.2514	11.19	0.00173913	0.04170288
(38) GRAD MJR: OTHER	----------	-------	------	----	----------	----------
Professional Experiences & Assignment Characteristics:						
(39) YRS PRES DIST	0.00647374	3.34430	0.0009	0.65	10.27130435	6.90700757
(40) (YRS PRES DIST)^2	-0.00022125	-3.24764	0.0012	-0.04	153.12347826	184.71522593
(41) HS PRINCIPAL--YES	0.07901822	6.06585	0.0001	8.22	0.20695652	0.40547682
(42) HS PRINCIPAL--NO	----------	-------	------	----	----------	----------
(43) HOURS OF TEACHING	-0.00316045	-1.55354	0.1209	-0.32	0.33913043	1.86890452
(44) $\log_e$ (DAYS OF WORK PER YR)	0.30693049	4.19582	0.0001	0.31	5.33737315	0.06255463
School Characteristics:						
(45) CONT EDUC	-0.09788207	-4.93593	0.0001	-9.32	0.04173913	0.20016657
(46) ADULT EDUC	-0.10066705	-3.38061	0.0008	-9.58	0.01739130	0.13083814
(47) NONTRAD HS	-0.10130269	-1.19653	0.2320	-9.63	0.00173913	0.04170288
(48) OTHER SCH PROG	----------	-------	------	----	----------	----------
(49) ACADEMIC PROG--YES	-0.03346620	-3.91239	0.0001	3.29	0.60695652	0.48885163
(50) ACADEMIC PROG--NO	----------	-------	------	----	----------	----------

TABLE A-2 (Continued)

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Significance (4)	% Effect on Prin. Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
School Characteristics:						
(51) ADV CURR--YES	0.01389462	1.71393	0.0871	1.40%	0.69043478	0.46271693
(52) ADV CURR--NO	----------	-------	------	----	----------	----------
District Characteristics:						
(53) HS DISTRICT--YES	0.06084479	4.18531	0.0001	6.27	0.09043478	0.28705337
(54) HS DISTRICT--NO	----------	-------	------	----	----------	----------
(55) EL DISTRICT--YES	0.03573147	3.28434	0.0011	3.64	0.21739130	0.41283014
(56) EL DISTRICT--NO	----------	-------	------	----	----------	----------
(57) ACHV INDEX-DIST	-0.00004662	-1.60624	0.1088	-0.005	53.10446058	132.05677921
(58) LOG_e (ADA)	0.11336413	4.29522	0.0001	0.11	9.74515651	1.47957371
(59) $[LOG_e (ADA)]^2$	-0.00402712	-3.19620	0.0015	-0.008	97.15339915	30.24074873
County & Regional Characteristics:						
(60) LOG_e (PRICE AGRI LAND/ACRE)	0.01677405	2.52834	0.0118	0.017	6.98243630	0.65996411
(61) PCT URBAN POP, COUNTY	-0.00390145	-2.18852	0.0291	-0.39	89.94260870	15.26793833
(62) (PCT URBAN POP, COUNTY)^2	0.00003453	2.55147	0.0110	0.007	8322.37739130	2228.53265466
(63) $[LOG_e$ (POP DENSITY, COUNTY)$]^2$	-0.00195674	-4.56292	0.00001	-0.004	41.46606538	18.10997303
(64) LOG_e (POPULATION, AREA)	0.01884267	3.82304	0.0001	0.019	14.41743442	1.51993731
(65) HOURS FROM CENTRAL CITY	-0.00562783	-1.15948	0.2468	-0.56	0.56479699	0.96760802

R^2 = 0.5802 F(51,523) = 14.174 Standard Error of the Estimate = 0.0813

Sample Size = 574

[a]The figures presented in column 5 represent the percentage effect on teachers' salaries for the dummy variables (i.e., the variables that take on only the values of 0 or 1) and elasticities (the percent effect on the dependent variable in response to a one percent change in the explanatory variable) for the variables in LOG_e or percentage form. For all other variables, the figures in column 5 reflect the percent effect on teachers' salaries in response to a one unit change in the explanatory variable (e.g., one year of experience, one year of age, one hour of time from the central city). For the coefficients of squared variables, column 5 reflects the percent rate of change in the percent effect.

TABLE A-3

DETERMINANTS OF ADMINISTRATORS' SALARIES
IN CALIFORNIA SCHOOL DISTRICTS, 1977-78

[DEPENDENT VARIABLE = $\log_e$ (ANNUAL SALARY)][a]

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Adm. Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
(1) INTERCEPT	7.14048444	16.35291	0.0001	----	1.00000000	0.00000000
Background Characteristics:						
(2) AGE	0.03803172	7.38219	0.0001	3.98%	47.91689008	8.02356795
(3) AGE2	-0.00055766	-6.57127	0.0001	-0.06	2360.26541556	742.18528847
(4) SEX--MALE	0.10888737	5.45107	0.0001	11.50	0.80697051	0.39520607
(5) SEX--FEMALE	----------	-------	------	----	----------	----------
Educational Preparation:						
(6) DEGREE--BACHELORS	----------	-------	------	----	----------	----------
(7) DEGREE--MASTERS	0.11225542	3.37195	0.0008	11.88	0.61126005	0.48811880
(8) DEGREE--CERT ADV ST	0.10571610	2.22731	0.0266	11.15	0.04021448	0.19672577
(9) DEGREE--EDD	0.18070384	4.89246	0.0001	19.81	0.22520107	0.41827574
(10) DEGREE--PHD	0.21647413	4.86391	0.0001	24.17	0.04557641	0.20884476
(11) GRAD HRS: LESS THAN 30	0.05854264	1.04761	0.2956	6.03	0.02412869	0.15365477
(12) GRAD HRS: MORE THAN 30	----------	-------	------	----	----------	----------
(13) ATTENDED TCHRS COL--YES	-0.03383324	-1.40034	0.1624	-3.33	0.07774799	0.26813428
(14) ATTENDED TCHRS COL--NO	----------	-------	------	----	----------	----------
(15) UG GRADE PT AVG	0.01554600	0.91055	0.3632	1.57	3.19383353	0.40691537
(16) UG MJR--HUMANITIES	----------	-------	------	----	----------	----------
(17) UG MJR--MATH SCI	0.05023642	1.88214	0.0607	5.15	0.12332440	0.32925085
(18) UG MJR--SOC SCI	0.03644717	1.69448	0.0911	3.71	0.27882038	0.44902128
(19) UG MJR--BUSINESS	0.05542490	1.76593	0.0784	5.70	0.08310992	0.27641908
(20) UG MJR--PHYS EDUC	0.01723623	0.51133	0.6095	1.74	0.05361930	0.22556747
(21) UG MJR--IND ARTS	0.03127776	0.80255	0.4228	3.18	0.04021448	0.19672577
(22) UG MJR--SPEC EDUC	0.05815926	0.95977	0.3379	5.99	0.01340483	0.11515506
(23) UG MJR--SEC EDUC	0.02942309	0.78403	0.4336	2.99	0.04021448	0.19672577
(24) UG MJR--ELEM EDUC	0.03292739	1.37139	0.1712	3.35	0.19839142	0.39932414
(25) UG MJR--FINE ARTS	0.01423714	0.35602	0.7221	1.43	0.03217158	0.17669259
(26) UG MJR--MISC	-0.16081006	-1.86811	0.0627	-14.85	0.00804290	0.08944079
(27) GRAD MJR: EDUC ADMIN	0.01529867	0.66337	0.5074	1.54	0.50938338	0.50058342
(28) GRAD MJR: EDUC CURR	0.01791871	0.62211	0.5343	1.81	0.10455764	0.30639357
(29) GRAD MJR: EDUC GUID	-0.00156154	-0.04032	0.9679	-0.16	0.04021448	0.19672577
(30) GRAD MJR: EDUC PSYC	-0.06980706	-2.37024	0.0184	-0.98	0.14745308	0.35503324
(31) GRAD MJR: BUSINESS	-0.11624178	-1.94258	0.0529	-10.97	0.01608579	0.12597454
(32) GRAD MJR: OTHER	----------	-------	------	----	----------	----------
Professional Experiences & Assignment Characteristics:						
(33) SUPT	----------	-------	------	----	----------	----------
(34) A SUPT	-0.03036199	-1.39085	0.1652	-2.99	0.23592493	0.42514579
(35) DIRECTOR	-0.07396458	-3.25977	0.0012	-7.13	0.16273458	0.44071050
(36) ASST DIRECTOR	-0.16834113	-3.31839	0.0010	-15.49	0.01876676	0.13588255
(37) SPECIALIST	-0.18374271	-5.31707	0.0001	-16.79	0.06166220	0.24086409
(38) LEGISLATIVE LIASON	-0.39108689	-2.90381	0.0040	-32.37	0.00268097	0.05177804
(39) HS SUPERVISOR	-0.11645919	-1.72574	0.0854	-10.99	0.01072386	0.10313766
(40) EL SUPERVISOR	-0.13309789	-1.45971	0.1454	-12.46	0.00536193	0.07312672
(41) DIST SUPERVISOR	-0.19600693	-7.96168	0.0001	-17.80	0.21647721	0.41101050
(42) GEN ADMIN--YES	0.04677067	3.08627	0.0022	4.79	0.53083110	0.49971835
(43) GEN ADMIN--NO	----------	-------	------	----	----------	----------
(44) ELEM ADMIN--YES	-0.03502485	-2.34338	0.0197	-3.44	0.37801609	0.48554296
(45) ELEM ADMIN--NO	----------	-------	------	----	----------	----------
(46) SPEC EDUC ADMIN--YES	0.03986600	1.72336	0.0858	4.07	0.30294906	0.46015062
(47) SPEC EDUC ADMIN--NO	----------	-------	------	----	----------	----------
(48) PSYC SERV--YES	-0.07056183	-2.57063	0.0106	-6.81	0.26541555	0.44214732
(49) PSYC SERV--NO	----------	-------	------	----	----------	----------
(50) LIBR SERV--YES	0.03744856	1.70239	0.0897	3.82	0.12868633	0.33530221
(51) LIBR SERV--NO	----------	-------	------	----	----------	----------
(52) HEALTH SERV--YES	0.05093750	2.05140	0.0410	5.23	0.15013405	0.35768255
(53) HEALTH SERV--NO	----------	-------	------	----	----------	----------

TABLE A-3 (Continued)

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Admn. Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
Professional Experiences & Assignment Characteristics:						
(54) BUSINESS AFFAIRS--YES	0.04198385	2.38561	0.0176	4.29	0.21715818	0.41286498
(55) BUSINESS AFFAIRS--NO	---	---	---	---	---	---
(56) PERS ADMIN--YES	0.00031204	0.01911	0.9848	0.03	0.26541555	0.44214732
(57) PERS ADMIN--NO	---	---	---	---	---	---
(58) PUBLIC REL--YES	0.15354049	2.61197	0.0094	16.60	0.01340483	0.11515506
(59) PUBLIC REL--NO	---	---	---	---	---	---
(60) EMPLOYEE REL--YES	0.04598859	0.96773	0.3339	4.71	0.01876676	0.13588255
(61) EMPLOYEE REL--NO	---	---	---	---	---	---
(62) FOOD SERV--YES	-0.10415851	-1.51049	0.1319	-9.89	0.01072386	0.10313766
(63) FOOD SERV--NO	---	---	---	---	---	---
(64) BILINGUAL PROG--YES	0.08658365	1.37045	0.1715	9.04	0.01072386	0.10313766
(65) BILINGUAL PROG--NO	---	---	---	---	---	---
District Characteristics:						
(66) HS DISTRICT--YES	0.07115631	3.08272	0.0022	7.37	0.10455764	0.30639357
(67) HS DISTRICT--NO	---	---	---	---	---	---
(68) EL DISTRICT--YES	0.04018966	2.25595	0.0248	4.10	0.27077748	0.44495824
(69) EL DISTRICT--NO	---	---	---	---	---	---
(70) ACHV INDEX-DIST	-0.00010422	-1.84515	0.0659	-0.01	58.38034508	119.31394683
(71) LOG_e (ADA)	0.04819351	7.10565	.048	.048	9.39358347	1.30939821
County & Regional Characteristics:						
(72) LOG_e (AVG PRICE NEW HOMES)	0.07917503	2.00844	0.0454	.079	10.58485069	0.23962704
(73) LOG_e (POPULATION, AREA)	0.01459324	1.34147	0.1807	.015	14.09298013	1.52311462
(74) LOG_e (POP DENSITY, AREA)	-0.01193340	-0.96841	0.3336	.012	5.98573735	1.39715029
(75) HOURS FROM CENTRAL CITY	-0.01251203	-1.47958	0.1400	-1.24	0.61574046	0.97168183

R^2 = 0.7579 F(53,319) = 18.845 Standard Error of the Estimate = 0.1177

Sample Size = 372

[a]The figures presented in column 5 represent the percentage effect on teachers' salaries for the dummy variables (i.e., the variables that take on only the values of 0 or 1) and elasticities (the percent effect on the dependent variable in response to a one percent change in the explanatory variable) for the variables in LOG_e or percentage form. For all other variables, the figures in column 5 reflect the percent effect on teachers' salaries in response to a one unit change in the explanatory variable (e.g., one year of experience, one year of age, one hour of time from the central city). For the coefficients of squared variables, column 5 reflects the percent rate of change in the percent effect.

TABLE A-4

DETERMINANTS OF SECRETARIAL SALARIES
IN CALIFORNIA SCHOOL DISTRICTS, 1976-77

[DEPENDENT VARIABLE = LOG_e (AVG. SALARY, SECR.)
Mean Value = 9.02475 Standard Deviation = 0.16140]

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Secr. Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
(1) INTERCEPT	7.24792823	19.55205	0.0001	----	1.00000000	0.00000000
District Characteristics:						
(2) PCT ELEM PUPILS	-0.00139080	-7.30669	0.0001	-0.14%	65.29690924	36.15185649
(3) PCT OTHER CLS MNRTY	-0.00034486	-0.86641	0.3868	-0.03	20.24124994	17.76817678
(4) PCT PROB PUPILS	0.01201816	2.07899	0.0383	1.21	1.50532864	1.22044862
County & Regional Characteristics:						
(5) LOG_e (AVG PRICE NEW HOMES)	0.17771548	4.90460	0.0001	0.178	10.54176084	0.24611361
(6) PCT URBAN POP, COUNTY	-0.00738350	-4.63372	0.0001	-0.74	77.04217076	24.42210605
(7) (PCT URBAN POP, COUNTY)^2	0.00006774	5.01010	0.0001	0.014	6530.35210712	3093.13189190
(8) LOG_e (POP DENSITY, COUNTY)	0.04513132	1.63120	0.1037	0.045	5.18396676	1.73193090
(9) [LOG_e (POP DENSITY, COUNTY)]^2	-0.00416562	-1.55280	0.1213	-0.008	29.86513577	17.85237226

R^2 = 0.3542 F(8,368) = 25.230 Standard Error of the Estimate = 0.1311

Sample Size = 376 Districts

[a]The figures presented in column 5 represent the percentage effect on teachers' salaries for the dummy variables (i.e., the variables that take on only the values of 0 or 1) and elasticities (the percent effect on the dependent variable in response to a one percent change in the explanatory variable) for the variables in LOG_e or percentage form. For all other variables, the figures in column 5 reflect the percent effect on teachers' salaries in response to a one unit change in the explanatory variable (e.g., one year of experience, one year of age, one hour of time from the central city). For the coefficients of squared variables, column 5 reflects the percent rate of change in the percent effect.

TABLE A-5

DETERMINANTS OF HOURLY WAGE RATES FOR CUSTODIANS
IN CALIFORNIA SCHOOL DISTRICTS, 1976-77

[DEPENDENT VARIABLE = LOG_e (AVG. HRLY. WAGE, CUSTODIANS)
Mean Value = 1.49728 Standard Deviation = 0.13275]

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Cust. Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
(1) INTERCEPT	0.47414737	0.77172	0.4407	----	1.00000000	0.00000000
District Characteristics:						
(2) PCT OTHER CLS MNRTY	-0.00092794	-2.96075	0.0032	-0.09%	20.04695424	18.40912482
(3) PCT PROB PUPILS	0.00975338	2.20502	0.0280	0.98	1.47285100	1.27996283
County & Regional Characteristics:						
(4) LOG_e (AVG PRICE NEW HOMES)	0.14221157	4.23441	0.0001	0.142	10.53332962	0.24586324
(5) LOG_e (AVG MX TEMP, WINTER)	-0.29157995	-3.32810	0.0010	-0.292	4.14998047	0.10102150
(6) PCT URBAN POP, COUNTY	-0.00520597	-3.45963	0.0006	-0.52	74.64941027	25.15601047
(7) $(\text{PCT URBAN POP, COUNTY})^2$	0.00005513	4.73927	0.0001	0.01	6203.87624472	3191.40708598
(8) LOG_e (POPULATION, COUNTY)	0.15708248	1.98777	0.0475	0.157	12.83742420	1.62008213
(9) $[LOG_e (\text{POPULATION, COUNTY})]^2$	-0.00663821	-2.26660	0.0239	-0.007	167.41797147	41.81039408
(10) LOG_e (POP DENSITY, COUNTY)	-0.05916649	-2.25607	0.0246	-0.059	5.06026575	1.75244474
(11) $[LOG_e (\text{POP DENSITY, COUNTY})]^2$	0.00628742	2.38081	0.0177	0.006	28.67015606	18.00593168

R^2 = 0.2977 F(10,416) = 17.633 Standard Error of the Estimate = 0.1126

Sample Size = 426 Districts

[a]The figures presented in column 5 represent the percentage effect on teachers' salaries for the dummy variables (i.e., the variables that take on only the values of 0 or 1) and elasticities (the percent effect on the dependent variable in response to a one percent change in the explanatory variable) for the variables in LOG_e or percentage form. For all other variables, the figures in column 5 reflect the percent effect on teachers' salaries in response to a one unit change in the explanatory variable (e.g., one year of experience, one year of age, one hour of time from the central city). For the coefficients of squared variables, column 5 reflects the percent rate of change in the percent effect.

TABLE A-6

DETERMINANTS OF HOURLY WAGE RATES FOR INSTRUCTIONAL AIDES IN CALIFORNIA SCHOOL DISTRICTS, 1976-77

[DEPENDENT VARIABLE = LOG_e (AVG. HRLY. WAGE, INSTR. AIDES)
Mean Value = 1.22690 Standard Deviation = 0.14006]

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Inst. Aides Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
(1) INTERCEPT	0.89541028	1.98433	0.0479	----	1.00000000	0.00000000
District Characteristics:						
(2) PCT ELEM PUPILS	-0.00063183	-3.58539	0.0004	-0.06%	70.17005715	35.64313948
(3) $[LOG_e (ADAE)]^2$	0.00060191	1.66094	0.0975	0.0012	61.99792498	20.67625990
(4) PCT PROB PUPILS	0.00833805	1.88851	0.0597	0.84	1.46819306	1.27701065
County & Regional Characteristics:						
(5) LOG_e (AVG PRICE NEW HOMES)	0.10113453	3.18399	0.0016	0.101	10.52549080	0.24498741
(6) $(PCT URBAN POP, COUNTY)^2$	0.00000914	2.08312	0.0379	0.0009	6149.82809851	3178.33783450
(7) LOG_e (POPULATION, COUNTY)	-0.13242129	-2.84981	0.0046	-0.132	12.82182240	1.62970625
(8) $[LOG_e (POPULATION, COUNTY)]^2$	0.00397153	2.31119	0.0213	0.008	167.04880027	42.03249935
(9) $[LOG_e (POPULATION, AREA)]^2$	0.00134904	3.92620	0.0001	0.003	177.90146500	49.16854112

R^2 = 0.3535 F(8,415) = 28.615 Standard Error of the Estimate = 0.1135

Sample Size = 423 Districts

[a]The figures presented in column 5 represent the percentage effect on teachers' salaries for the dummy variables (i.e., the variables that take on only the values of 0 or 1) and elasticities (the percent effect on the dependent variable in response to a one percent change in the explanatory variable) for the variables in LOG_e or percentage form. For all other variables, the figures in column 5 reflect the percent effect on teachers' salaries in response to a one unit change in the explanatory variable (e.g., one year of experience, one year of age, one hour of time from the central city). For the coefficients of squared variables, column 5 reflects the percent rate of change in the percent effect.

TABLE A-7

DETERMINANTS OF HOURLY WAGE RATES FOR BUS DRIVERS
IN CALIFORNIA SCHOOL DISTRICTS, 1976 77

[DEPENDENT VARIABLE = LOG_e (AVG. HRLY. WAGE, BUS DRIVERS)
Mean Value = 1.5262 Standard Deviation = 0.12172]

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Bus Driv. Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
(1) INTERCEPT	1.38686587	4.26318	0.0001	----	1.00000000	0.00000000
District Characteristics:						
(2) HS DISTRICT--YES	0.04018331	2.59237	0.0099	4.10%	0.16897507	0.37524999
(3) HS DISTRICT--NO	----------	-------	------	----	----------	----------
(4) LOG_e (ADA)	-0.10139044	-2.96276	0.0033	-0.101	7.88742014	1.35468498
(5) $[LOG_e (ADA)]^2$	0.00580322	2.72866	0.0067	0.012	64.04147647	21,70817723
(6) PCT PROB PUPILS	0.01006930	2.21850	0.0272	1.01	1.47059166	1.30949366
County & Regional Characteristics:						
(7) LOG_e (AVG PRICE NEW HOMES)	0.06069726	2.00370	0.0459	0.061	10.52506029	0.24005050
(8) PCT URBAN POP, COUNTY	-0.00487502	-4.35326	0.0001	-0.49	74.87395687	24.30979130
(9) (PCT URBAN POP, COUNTY)^2	0.00004579	5.00167	0.0001	0.009	6195.43727412	3123.40714871
(10) HOURS FROM CENTRAL CITY	-0.01012342	-1.94375	0,0527	-1.01	1.15614978	1.41674061

R^2 = 0.2178 F(8,352) = 12.255 Standard Error of the Estimate = 0.10887

Sample Size = 360 Districts

[a]The figures presented in column 5 represent the percentage effect on teachers' salaries for the dummy variables (i.e., the variables that take on only the values of 0 or 1) and elasticities (the percent effect on the dependent variaole in response to a one percent change in the explanatory variable) for the variables in LOG_e or percentage form. For all other variables, the figures in column 5 reflect the percent effect on teachers' salaries in response to a one unit change in the explanatory variable (e.g., one year of experience, one year of age, one hour of time from the central city). For the coefficients of squared variables, column 5 reflects the percent rate of change in the percent effect.

TABLE A-8

DETERMINANTS OF EXPENDITURES ON TRANSPORTATION SERVICES
IN CALIFORNIA SCHOOL DISTRICTS, 1976-77

[DEPENDENT VARIABLE = LOG_e (TOTAL TRANS. EXPEND.)
Mean Value = 11.2570 Standard Deviation = 1.30516]

Explanatory Variables (1)	Estimated Coefficient (2)	t-Ratio (3)	Level of Significance (4)	% Effect on Trans. Salaries[a] (5)	Mean Value (6)	Standard Deviation (7)
(1) INTERCEPT	5.00258302	9.41146	0.0001	----	1.00000000	0.00000000
District Characteristics:						
(2) LOG_e (PUPILS TRANSPORTED)	0.45433333	4.03167	0.00001	0.454%	6.24214268	1.36386575
(3) $[LOG_e$ (PUPILS TRANSPORTED)$]^2$	0.01285000	1.39989	0.1620	0.026	40.82185516	16.79571809
(4) LOG_e (HS PUPILS TRANSPORTED)	0.00743184	3.97675	0.0001	0.0074	-5.61818697	9.65733220
(5) LOG_e (PUP TRANS WITHIN MIN DIST)	0.00035759	0.22243	0.8240	0.0004	-7.95012089	8.09929921
(6) LOG_e (PUP TRANS, PRIV CONTR)	-0.00686887	-1.96266	0.0501	-0.007	1.62503617	3.82873073
(7) LOG_e (OTHER MILES)	0.06446582	5.65793	0.0001	0.064	7.61487916	5.68747366
(8) $[LOG_e$ (OTHER MILES)$]^2$	0.00441946	6.56806	0.0001	0.009	90.28830217	38.72563478
(9) $[LOG_e$ (PUP TRANS)$]$ x $[LOG_e$ (OTHER MILES)$]$	-0.00571357	-3.44002	0.0006	-0.006	50.21704981	38.42527372
(10) INDEX, BUS DRIVERS WAGES	0.87665545	2.53644	0.0114	0.877	0.99162354	0.05633639
(11) LOG_e (ADA)	0.7159182	0.74015	0.4595	0.072	7.17022782	1.70418665
(12) $[LOG_e$ (ADA)$]^2$	0.01433720	2.23353	0.0258	0.028	54.31233946	24.63447439
County & Regional Characteristics:						
(13) LOG_e (THEFTS, DISTRICT)	0.11323766	3.60076	0.0003	0.113	4.01393573	0.43940425
(14) LOG_e (POP DENSITY, COUNTY)	0.03357183	2.08049	0.0378	0.034	4.77197096	1.70592597
(15) PCT URBAN POP, COUNTY	-0.00153349	-1.66686	0.0960	-0.15	71.05659671	25.15087986
(16) LOG_e (PUPIL DENSITY, DISTRICT)	-0.11017889	-9.41777	0.0001	-0.110	2.89981656	2.35170240

R^2 = 0.9349 F(15,696) = 666.603 Standard Error of the Estimate = 0.3365

Sample Size = 711 Districts

[a] The figures presented in column 5 represent the percentage effect on teachers' salaries for the dummy variables (i.e., the variables that take on only the values of 0 or 1) and elasticities (the percent effect on the dependent variable in response to a one percent change in the explanatory variable) for the variables in LOG_e or percentage form. For all other variables, the figures in column 5 reflect the percent effect on teachers' salaries in response to a one unit change in the explanatory variable (e.g., one year of experience, one year of age, one hour of time from the central city). For the coefficients of squared variables, column 5 reflects the percent rate of change in the percent effect.

TABLE A-9

VARIABLE NAMES, DEFINITIONS, AND SOURCES

Variable Name	Variable Definition	Source
Dependent Variables:		
LOG_e (ANNUAL SALARY)	NATURAL LOG OF THE ANNUAL SALARY OF CERTIFICATED SCHOOL PERSONNEL	SSP
LOG_e (AVG SALARY, SECR)	NATURAL LOG OF THE AVERAGE ANNUAL SALARY OF SECRETARIES IN THE SCHOOL DISTRICT	ERS-III
LOG_e (AVG HRLY WAGE, INSTR AIDES)	NATURAL LOG OF THE AVERAGE HOURLY WAGE RATE OF INSTRUCTIONAL AIDES IN THE SCHOOL DISTRICT	ERS-III
LOG_e (AVG HRLY WAGE, CUSTODIANS)	NATURAL LOG OF THE AVERAGE HOURLY WAGE RATE OF CUSTODIANS IN THE SCHOOL DISTRICT	ERS-III
LOG_e (AVG HRLY WAGE, BUS DRIVERS)	NATURAL LOG OF THE AVERAGE HOURLY WAGE RATE OF BUS DRIVERS IN THE SCHOOL DISTRICT	ERS-III
LOG_e (TOTAL TRANS EXPEND)	NATURAL LOG OF THE TOTAL EXPENDITURES FOR TRANSPORTATION SERVICES BY THE SCHOOL DISTRICT	J-141
Independent Variables:		
Intercept:		
INTERCEPT	CONSTANT TERM IN A REGRESSION EQUATION	
Background Characteristics of Certificated Personnel:		
AGE	AGE AS OF MOST RECENT BIRTHDAY	SSP
AGE^2	AGE SQUARED	SSP
SEX--MALE	=1 IF MALE	SSP
SEX--FEMALE	=1 IF FEMALE	SSP
RACE--INDIAN	=1 IF AMERICAN INDIAN OR ALASKAN NATIVE	SSP
RACE--ASIAN	=1 IF ASIAN OR PACIFIC ISLANDER	SSP
RACE--FILIPINO	=1 IF FILIPINO	SSP
RACE--BLACK	=1 IF BLACK--NOT OF HISPANIC ORIGIN	SSP
RACE--HISPANIC	=1 IF HISPANIC	SSP
RACE--WHITE	=1 IF WHITE--NOT OF HISPANIC ORIGIN	SSP
SNGL, DV, SP--NC	=1 IF SINGLE, OR DIVORCED OR SEPARATED WITH NO CHILDREN	SSP
MARRIED, DV, SP--C	=1 IF MARRIED, OR DIVORCED OR SEPARATED WITH CHILDREN	SSP
Educational Preparation of Certificated Personnel:		
DEGREE--BACHELORS	=1 IF HIGHEST DEGREE IS BACHELORS	SSP
DEGREE--MASTERS	=1 IF HIGHEST DEGREE IS MASTERS	SSP
DEGREE--CERT ADV ST	=1 IF HIGHEST DEGREE IS CERTIFICATE OF ADVANCED STUDY	SSP
DEGREE--EDD	=1 IF HIGHEST DEGREE IS DOCTOR OF EDUCATION	SSP
DEGREE--PHD	=1 IF HIGHEST DEGREE IS DOCTOR OF PHILOSOPHY	SSP
CERTIFIED--YES	=1 IF PERMANENTLY CERTIFIED BY THE STATE	SSP
CERTIFIED--NO	=1 IF NOT PERMANENTLY CERTIFIED	SSP
ATTENDED TCHRS COL--YES	=1 IF ATTENDED TEACHERS COLLEGE	SSP
ATTENDED TCHRS COL--NO	=1 IF DID NOT ATTEND TEACHERS COLLEGE	SSP
GRAD HRS: 0-14	=1 IF EARNED 0 TO 14 GRAD HRS CREDIT	SSP
GRAD HRS: 15-29	=1 IF EARNED 15 TO 29 GRAD HRS CREDIT	SSP
GRAD HRS: 30-44	=1 IF EARNED 30 TO 44 GRAD HRS CREDIT	SSP
GRAD HRS: 45-59	=1 IF EARNED 45 TO 59 GRAD HRS CREDIT	SSP
GRAD HRS: 60 OR MORE	=1 IF EARNED 60 OR MORE GRAD HRS CREDIT	SSP
GRAD HRS: LESS THAN 60	=1 IF EARNED LESS THAN 60 GRAD HRS CREDIT	SSP
GRAD HRS: LESS THAN 30	=1 IF EARNED LESS THAN 30 GRAD HRS CREDIT	SSP
GRAD HRS: 30 OR MORE	=1 IF EARNED 30 OR MORE GRAD HRS CREDIT	SSP
COL SELECT: 30 TO 39	=1 IF SELECTIVITY UNDERGRAD COL IS 2 1/2-33 1/3 %TILE	ASTIN
COL SELECT: 40 TO 49	=1 IF SELECTIVITY UNDERGRAD COL IS 33 1/3-50 %TILE	ASTIN
COL SELECT: 50 TO 59	=1 IF SELECTIVITY UNDERGRAD COL IS 50-66 2/3 %TILE	ASTIN
COL SELECT: 60 TO 69	=1 IF SELECTIVITY UNDERGRAD COL IS 66 2/3-97 1/2 %TILE	ASTIN
COL SELECT: 70 OR GREATER	=1 IF SELECTIVITY UNDERGRAD COL IS TOP 2 1/2%TILE	ASTIN
UG GRADE PT AVG	UNDERGRADUATE GRADE POINT AVERAGE	SSP

TABLE A-9 (Continued)

Variable Name	Variable Definition	Source
Independent Variables:		
Educational Preparation of Certificated Personnel:		
UG MJR--HUMANITIES	=1 IF UNDERGRAD MJR IN HUMANITIES	SSP
UG MJR--MATH-SCI	=1 IF UNDERGRAD MJR IN MATH OR SCIENCE	SSP
UG MJR--SOC SCI	=1 IF UNDERGRAD MJR IN SOCIAL SCIENCE	SSP
UG MJR--BUSINESS	=1 IF UNDERGRAD MJR IN BUSINESS	SSP
UG MJR--PHYS EDUC	=1 IF UNDERGRAD MJR IN PHYSICAL EDUCATION	SSP
UG MJR--IND ARTS	=1 IF UNDERGRAD MJR IN INDUSTRIAL ARTS	SSP
UG MJR--SPEC EDUC	=1 IF UNDERGRAD MJR IN SPECIAL EDUCATION	SSP
UG MJR--SEC EDUC	=1 IF UNDERGRAD MJR IN SECONDARY EDUCATION	SSP
UG MJR--ELEM EDUC	=1 IF UNDERGRAD MJR IN ELEMENTARY EDUCATION	SSP
UG MJR--FINE ARTS	=1 IF UNDERGRAD MJR IN FINE ARTS	SSP
UG MJR--MISC	=1 IF ANY OTHER UNDERGRAD MJR	SSP
GRAD MJR: EDUC ADMIN	=1 IF GRADUATE MAJOR IS EDUCATIONAL ADMINISTRATION	SSP
GRAD MJR: EDUC CURR	=1 IF GRADUATE MAJOR IS EDUCATIONAL CURRICULUM	SSP
GRAD MJR: EDUC GUID	=1 IF GRADUATE MAJOR IS EDUCATIONAL GUIDANCE	SSP
GRAD MJR: EDUC PSYC	=1 IF GRADUATE MAJOR IS EDUCATIONAL PSYCHOLOGY	SSP
GRAD MJR: BUSINESS	=1 IF GRADUATE MAJOR IS BUSINESS ADMINISTRATION	SSP
GRAD MJR: OTHER	=1 IF GRADUATE MAJOR IN OTHER AREA	SSP
Professional Experiences & Assignment Characteristics for Certificated Personnel:		
YRS PRES DIST	YRS EXPER IN PRESENT DISTRICT, CURRENT JOB TITLE	SSP
$(\text{YRS PRES DIST})^2$	YRS PRESENT DISTRICT SQUARED	SSP
TOTAL YRS EXPER	TOTAL YRS OF EXPERIENCE, CURRENT JOB TITLE	SSP
$(\text{TOTAL YRS EXPER})^2$	TOTAL YRS OF EXPERIENCE SQUARED	SSP
YRS UNEMPLD	YRS UNEMPLOYED SINCE BECOMING AN EDUCATOR	SSP
TENURED--YES	=1 IF INDIVIDUAL HAS TENURE	SSP
TENURED--NO	=1 IF INDIVIDUAL DOES NOT HAVE TENURE	SSP
JR HS TEACHER	=1 IF A JUNIOR HIGH SCHOOL TEACHER	SSP
ELEM/HS TEACHER	=1 IF AN ELEMENTARY OR HIGH SCHOOL TEACHER	SSP
SPEC EDUC TCH--YES	=1 IF SPECIAL EDUCATION TEACHER	SSP
SPEC EDUC TCH--NO	=1 IF NOT A SPECIAL EDUCATION TEACHER	SSP
HS PRINCIPAL--YES	=1 IF A HIGH SCHOOL PRINCIPAL	SSP
HS PRINCIPAL--NO	=1 IF NOT A HIGH SCHOOL PRINCIPAL	SSP
HOURS OF TEACHING	NUMBER OF HOURS SPENT TEACHING	SSP
LOG_e (DAYS WORK PER YR)	NATURAL LOG OF DAYS OF WORK PER YEAR	SSP
SUPERINTENDENT	=1 IF A SUPERINTENDENT	SSP
ASST SUPT	=1 IF AN ASSISTANT SUPERINTENDENT	SSP
DIRECTOR	=1 IF A DIRECTOR OF A DISTRICT WIDE PROGRAM	SSP
ASST DIRECTOR	=1 IF AN ASSISTANT DIRECTOR	SSP
SPECIALIST	=1 IF AN EDUCATIONAL SPECIALIST	SSP
LEGISLATIVE LIASON	=1 IF A LEGISLATIVE LIASON OFFICER	SSP
HS SUPERVISOR	=1 IF A HIGH SCHOOL SUPERVISOR	SSP
EL SUPERVISOR	=1 IF AN ELEMENTARY SCHOOL SUPERVISOR	SSP
DIST SUPERVISOR	=1 IF A DISTRICT WIDE SUPERVISOR	SSP
GEN ADMIN--YES	=1 IF DUTIES INVOLVE GENERAL ADMINISTRATION OF DIST AFFAIRS	SSP
GEN ADMIN--NO	=1 IF DUTIES DO NOT INVOLVE GENL ADMIN OF DIST AFFAIRS	
ELEM ADMIN--YES	=1 IF DUTIES INVOLVE ELEMENTARY ADMINISTRATION	SSP
ELEM ADMIN--NO	=1 IF DUTIES DO NOT INVOLVE ELEMENTARY ADMINISTRATION	SSP
SPEC EDUC ADMIN--YES	=1 IF DUTIES INVOLVE ADMINISTRATION OF SPECIAL EDUCATION	SSP
SPEC EDUC ADMIN--NO	=1 IF DUTIES DO NOT INVOLVE ADMINISTRATION OF SPEC EDUC	SSP
PSYC SERV--YES	=1 IF DUTIES INVOLVE PSYCHOLOGICAL SERVICES	SSP
PSYC SERV--NO	=1 IF DUTIES DO NOT INVOLVE PSYCHOLOGICAL SERVICES	SSP
LIBR SERV--YES	=1 IF DUTIES INVOLVE LIBRARY SERVICES ADMINISTRATION	SSP
LIBR SERV--NO	=1 IF DUTIES DO NOT INVOLVE LIBRARY SERVICES ADMINISTRATION	SSP
HEALTH SERV--YES	=1 IF DUTIES INVOLVE HEALTH SERVICES ADMINISTRATION	SSP
HEALTH SERV--NO	=1 IF DUTIES DO NOT INVOLVE HEALTH SERVICES ADMINISTRATION	SSP

TABLE A-9 (Continued)

Variable Name	Variable Definition	Source
Independent Variables:		
Professional Experiences & Assignment Characteristics for Certificated Personnel:		
BUSINESS AFFAIRS--YES	=1 IF DUTIES INVOLVE ADMINISTRATION OF BUSINESS AFFAIRS	SSP
BUSINESS AFFAIRS--NO	=1 IF DUTIES DO NOT INVOLVE ADMIN OF BUSINESS AFFAIRS	SSP
PERS ADMIN--YES	=1 IF DUTIES INVOLVE PERSONNEL ADMINISTRATION	SSP
PERS ADMIN--NO	=1 IF DUTIES DO NOT INVOLVE PERSONNEL ADMINISTRATION	SSP
PUBLIC REL--YES	=1 IF DUTIES INVOLVE PUBLIC RELATIONS	SSP
PUBLIC REL--NO	=1 IF DUTIES DO NOT INVOLVE PUBLIC RELATIONS	SSP
EMPLOYEE REL--YES	=1 IF DUTIES INVOLVE EMPLOYEE RELATIONS	SSP
EMPLOYEE REL--NO	=1 IF DUTIES DO NOT INVOLVE EMPLOYEE RELATIONS	SSP
FOOD SERV--YES	=1 IF DUTIES INVOLVE ADMINISTRATION OF FOOD SERVICES	SSP
FOOD SERV--NO	=1 IF DUTIES DO NOT INVOLVE ADMINISTRATION OF FOOD SERVICES	SSP
BILINGUAL PROG--YES	=1 IF DUTIES INVOLVE ADMINISTRATION OF BILINGUAL PROGRAM	SSP
BILINGUAL PROG--NO	=1 IF DUTIES DO NOT INVOLVE ADMINISTRATION OF BILINGUAL PROG	SSP
Classroom Characteristics of Teachers:		
% HISPANIC PUPILS	% HISPANIC PUPILS IN CLASSROOM	SSP
% BLACK PUPILS	% BLACK--NONHISPANIC PUPILS IN CLASSROOM	SSP
% MENTALLY GIFTED	% MENTALLY GIFTED MINORS IN CLASSROOM	SSP
School Characteristics of Teachers & Principals:		
CONT EDUC	=1 IF ASSIGNED TO CONTINUING EDUCATION PROGRAM	CDS
ADULT EDUC	=1 IF ASSIGNED TO ADULT EDUCATION PROGRAM	CDS
NONTRAD HS	=1 IF ASSIGNED TO NONTRADITIONAL HIGH SCHOOL	CDS
OTHER SCH PROG	=1 IF ASSIGNED TO OTHER SCHOOL PROGRAMS	CDS
ACADEMIC PROGR--YES	=1 IF SCHOOL PROGRAM HAS AN ACADEMIC ORIENTATION	SSP
ACADEMIC PROGR--NO	=1 IF SCHOOL PROGRAM DOES NOT HAVE AN ACADEMIC ORIENTATION	SSP
ADV CURR--YES	=1 IF SCHOOL HAS ADVANCED CURRICULUM PROGRAM	SSP
ADV CURR--NO	=1 IF SCHOOL DOES NOT HAVE ADVANCED CURRICULUM PROGRAM	SSP
% NON+LIM ENGL SPKG	% NON AND LIMITED ENGLISH-SPEAKING PUPILS	R-30
LOG_e (OTH PROF/PUP)	NATURAL LOG OF OTHER PROFESSIONAL EDUCATORS PER PUPIL	R-30
District Characteristics:		
HS DISTRICT--YES	=1 IF A HIGH SCHOOL DISTRICT	CDS
HS DISTRICT--NO	=1 IF NOT A HIGH SCHOOL DISTRICT	CDS
EL DISTRICT--YES	=1 IF AN ELEMENTARY SCHOOL DISTRICT	CDS
EL DISTRICT--NO	=1 IF NOT AN ELEMENTARY SCHOOL DISTRICT	CDS
% SQ FT PRE 1949	% OF SQ FOOTAGE OF SCHOOL BUILDINGS BUILT BEFORE 1949	CSFES
ACHV INDEX--DIST	ACHIEVEMENT INDEX FOR THE DISTRICT, AVG % CORRECT	ASST
LOG_e (ADA)	NATURAL LOG OF AVERAGE DAILY ATTENDANCE	CSDE
$[LOG_e (ADA)]^2$	LOG_e (ADA) SQUARED	CSDE
$[LOG_e (ADAE)]^2$	NATURAL LOG OF COMPARABLE ELEMENTARY AVERAGE DAILY ATTENDANCE, QUANTITY SQUARED[a]	CSDE
% ELEM PUPILS	% OF ELEMENTARY PUPILS IN THE DISTRICT	R-30
% OTHER CLS MNRTY	% OF NONINSTRUCTIONAL CLASSIFIED PERSONNEL WHO ARE MINORITIES	R-30
% PROB PUPILS	% OF PROBLEM PUPILS IN DISTRICT (PROBLEM REFERS TO PREGNANT MINORS, DRUG DEPENDENT MINORS, LEARNING DISABLE, BEHAVIORAL DISORDERS, AND EMOTIONALLY DISTURBED)	R-30
LOG_e (PUPILS TRANSPORTED)	NATURAL LOG OF THE NUMBER OF PUPILS TRANSPORTED TO AND FROM SCHOOL IN THE DISTRICT	J-141

TABLE A-9 (Continued)

Variable Name	Variable Definition	Source
Independent Variables:		
District Characteristics:		
$[\text{LOG}_e \text{ (PUPILS TRANSPORTED)}]^2$	LOG_e (PUPILS TRANSPORTED) QUANTITY SQUARED	J-141
LOG_e (HS PUPILS TRANSPORTED)	NATURAL LOG OF THE NUMBER OF HIGH SCHOOL PUPILS TRANSPORTED	J-141
LOG_e (PUP TRANS WITHIN MIN DISTANCE)	NATURAL LOG OF THE NUMBER OF PUPILS WHO LIVE WITHIN MINIMUM DISTANCES TO SCHOOL AND ARE TRANSPORTED TO AND FROM SCHOOL	J-141
LOG_e (PUP TRANS, PRIV CONTR)	NATURAL LOG OF THE ESTIMATED NUMBER OF PUPILS TRANSPORTED BY PRIVATE CONTRACTOR TO AND FROM SCHOOL[b]	J-141
LOG_e (OTHER MILES)	NATURAL LOG OF MILES OF FIELD TRIPS AND SPECIAL EVENTS, OTHER THAN HOME TO SCHOOL	J-141
$[\text{LOG}_e \text{ (OTHER MILES)}]^2$	LOG_e (OTHER MILES) QUANTITY SQUARED	J-141
INDEX, BUS DRIVERS WAGES	COST INDEX FOR BUS DRIVERS ESTIMATED FROM TABLE III-4	Eq. (11) Chapter VI
LOG_e (PUPIL DENSITY, DISTRICT)	NATURAL LOG OF PUPILS PER SQUARE MILE LIVING WITHIN THE BOUNDARIES OF THE SCHOOL DISTRICT	SDQ, CQ
LOG_e (THEFTS, DISTRICT)	NATURAL LOG OF AUTO THEFTS AND VANDALISM REPORTED BY CRIME AGENCIES WITHIN THE SCHOOL DISTRICT BOUNDARIES	FBI
County & Regional Characteristics:		
LOG_e (PRICE AGRI LAND/ACRE)	NATURAL LOG OF THE PRICE OF AGRICULTURAL LAND PER ACRE IN THE COUNTY	AGRI
LOG_e (AVG PRICE NEW HOMES)	NATURAL LOG OF THE AVERAGE PRICE OF NEW HOMES IN THE COUNTY	ABSTR
PCT URBAN POP, COUNTY	PERCENT URBAN POPULATION IN THE COUNTY	CENSUS
$(\text{PCT URBAN POP, COUNTY})^2$	PERCENT URBAN POPULATION, COUNTY SQUARED	CENSUS
LOG_e (POPULATION, COUNTY)	NATURAL LOG OF POPULATION IN THE COUNTY	CPR
$[\text{LOG}_e \text{ (POPULATION, COUNTY)}]^2$	LOG_e (POPULATION IN COUNTY) SQUARED	CPR
LOG_e (POP DENSITY, COUNTY)	NATURAL LOG OF POPULATION PER SQUARE MILE IN COUNTY	CPR
$[\text{LOG}_e \text{ (POP DENSITY, COUNTY)}]^2$	LOG_e (POP DENSITY, COUNTY) SQUARED	CPR
$[\text{LOG}_e \text{ (POPULATION, AREA)}]^2$	LOG_e (POPULATION IN AREA) QUANTITY SQUARED[c]	CENSUS
$[\text{LOG}_e \text{ (POP DENSITY IN AREA)}]^2$	LOG_e (POPULATION DENSITY IN AREA) QUANTITY SQUARED[c]	CENSUS
HOURS FROM CENTRAL CITY	DISTANCE TO THE NEAREST CENTRAL CITY IN HOURS FROM THE COUNTY SEAT OF THE COUNTY IN WHICH THE DISTRICT IS LOCATED	COMP
$(\text{HOURS FROM CENTRAL CITY})^2$	HOURS FROM CENTRAL CITY SQUARED	COMP
LWMXTEMP	NATURAL LOG OF AVERAGE MAXIMUM WINTER TEMPERATURE	NCC

[a]For elementary and unified school districts, comparable elementary average daily attendance simply refers to the actual elementary average daily attendance in the district. For high school districts, the average ratio of elementary to high school pupils in the state was used to adjust the average daily attendance figures to obtain comparable average daily attendance. This was regarded as an estimate of the number of elementary pupils contained within the boundaries of any given high school district. The purpose of this procedure was to obtain a figure for district size that was comparable across all districts despite differences in composition of pupils.

[b]This estimate of number of pupils transported by private contractor was made by multiplying the percent of total miles traveled to and from school by private contractors by the total number of pupils transported by the district.

[c]Area in this context is defined as the metropolitan area for districts located within metropolitan areas and the county for districts located outside metropolitan areas.

Source Code	Source References
ABSTR	California Statistical Abstract 1977, State of California Documents Section (1977), Table 1-4 (p. 115).
AGRI	1974 Census of Agriculture, U.S. Department of Commerce, Bureau of the Census, Table 1. Number, Land, and Value of Farms: 1974 and 1969.
ASST	Assessment and Evaluation Program of the California State Department of Education.
ASTIN	Astin, Alexander W. Who Goes Where to College, Council on Education, Chicago, Il. (1965)
CDS	County, District, School Code Information, Ownership Codes.
CENSUS	1970 U.S. Census
COMP	Computed
CPR	Current Population Reports, Federal State Cooperative Program for Population Estimates, U.S. Department of Commerce, Bureau of the Census, September 1977, Table 1.
CQ	County Questionnaire Requesting Square Mileage Data by District.
CSDE	General Sources, California State Department of Education.
CSFES	California School Facilities Equalization Survey.
ERS-I	"Salaries Scheduled for Professional Personnel in California Public Schools, 1976-77," Part I of the Survey of Salaries and Wages in California Public Schools by the Educational Research Service, Inc. (December 1976).
ERS-III	"Wages and Salaries Paid Support Personnel in California Public Schools, 1976-77," Part II of the Survey of Salaries and Wages in California Public Schools by the Educational Research Service, Inc. (December 1976), pp. 39-57.
FBI	Uniform Crime Reports of the Federal Bureau of Investigation, Washington, D.C.
J-141	Form J-141, California State Department of Education.
NCC	Climatological Data Volume 80, National Climatic Center, Asheville, N.C.
R-30	Form R-30, Enrollment and Staff Data, Fall 1977, California State Department of Education
SDQ	School District Questionnaire--Cost of Education
SSP	Survey of Employment Patterns of School Personnel

APPENDIX B

APPENDIX B

COMPUTATION OF THE INDICES OF EDUCATIONAL COSTS

The basic procedure in calculation of the component indices involves simulation of the variations in educational expenditures, whether they be on the salaries of teachers or transportation services, that would exist if only the uncontrollable factors varied across school districts.

Computation of the Component Indices

To demonstrate the technique for computation of the component indices from the empirical estimates, let us begin with a simple specification of a salary equation for teachers. Equation (1) is in a similar form to those equations used to obtain the empirical results:

$$\text{LOG}_e\ (\text{SALARY}) = \hat{\alpha} + \hat{\beta}_1 \cdot Q_1 + \hat{\beta}_2 \cdot Q_2 + \hat{\gamma}_1 X_1 + \hat{\gamma}_2 X_2 \qquad (1)$$

where Q_1 and Q_2 are controllable variables (e.g., degree level, experience, sex, or race of teachers), X_1 and X_2 are uncontrollable variables (e.g., district size or percent urban population in the county), and the $\hat{\alpha}$, $\hat{\beta}_1$, $\hat{\beta}_2$, $\hat{\gamma}_1$ and $\hat{\gamma}_2$ are the estimated coefficients (e.g., like those presented in column 2 of the tables in Appendix A). In this example, the index of teacher costs will be computed by determining the relative difference in teachers' salaries caused only by variations in the uncontrollable variables X_1 and

X_2. For the purpose of computing the index of teacher costs, we will compare all districts to the average district in the state. Therefore, the difference in teacher costs between some given district, call it district i, and the average district in the state is given by the expression,

$$\text{LOG}_e(\text{SALARY}_i) - \text{LOG}_e(\overline{\text{SALARY}}) = \hat{\alpha} + \hat{\beta}_1 \overline{Q}_1 + \hat{\beta}_2 \overline{Q}_2 + \gamma_1 X_{1i} + \gamma_2 X_{2i} - (\hat{\alpha} + \hat{\beta}_1 \overline{Q}_1 + \hat{\beta}_2 \overline{Q}_2 + \gamma_1 \overline{X}_1 + \gamma_2 \overline{X}_2) \quad (2)$$

where the subscripts i indicate value of a variable for district i and the bars over the variables indicate the mean values for the average district in the state. Note that both districts are assigned the average amount of teacher characteristics Q_1 and Q_2 in order to isolate the variations in salaries between the two districts caused by the variations in the variables X_1 and X_2. Subtracting appropriate terms and rewriting equation (2) using the properties of logarithms, we have

$$\text{LOG}_e(\text{SALARY}_i/\overline{\text{SALARY}}) = \gamma_1 (X_{1i} - \overline{X}_1) + \gamma_2 (X_{2i} - \overline{X}_2) \quad (3)$$

Finally, taking the anti-logarithms of both sides of equation (3), the index of teacher costs is given by the expression,

$$\text{SALARY}_i/\overline{\text{SALARY}} = \text{EXP}[\gamma_1 (X_{1i} - \overline{X}_1) + \gamma_2 (X_{2i} - \overline{X}_2)] \quad (4)$$

A similar equation may be developed for each of the component indices including teachers, principals, administrators, secretarial and clerical personnel, custodial and maintenance personnel, instructional aides and other classified instructional personnel, transportation personnel and transportation services. The variables X_1 and X_2 and their corresponding coefficients in the example equation (4) would be replaced by the list of uncontrollable variables for each of the component indices.

To simplify somewhat the writing out of the indices and to facilitate the use of the data sets that will be forthcoming as part of the output of this education cost project, the computer mnemonics have been used to designate the uncontrollable variables in the index computations below. Table B-1 sets out and defines the list of computer symbols used to designate each of the variables listed in the tables of equations in previous Chapters. The computer symbols used for overall cost of education and each of the component indices are also defined. In addition, the mean values of the uncontrollable variables used in the computations below are also indicated in Table B-1.

The numbers appearing immediately in front of EXP in each equation below are simply adjustment factors that set the mean value of each component index to one. The symbol EXP simply refers to the exponential which forms the base of natural logarithms.

1. Index of Teacher Costs [Table A-1 variables (65) through (78)]:

$$\begin{aligned} ITCH = {} & 0.99990001\ EXP[.02219492 \cdot (LADA-6.766) - .00081697 \cdot (LADA2-49.371) \\ & + .00991935 \cdot (LAGLD-6.542) + .05015117 \cdot (LVALNHO-10.5) \\ & - .00436576 \cdot (PURB70-68.886) + .00003635 \cdot (PURB702-5402.00) \\ & + .20091412 \cdot (LPOPCO-12.476) - .006649 \cdot (LPOPCO2-158.165) \\ & - .06403572 \cdot (LPDENSC-4.638) + .00339949 \cdot (LPDENSC2-24.892) \\ & - .00085171 \cdot (LPOPA2-166.377) + .00306973 \cdot (LPDENSA2-25.407) \\ & - .01846332 \cdot (TCCITYH-1.449) + .00294176 \cdot (TCCITY2-4.507)] \end{aligned} \quad (5)$$

2. Index of Principal Costs [Table A-2 variables (58) through (65)]:

$$\begin{aligned} IPRN = {} & 0.9904912837\ EXP[.11336413 \cdot (LADA-6.766) - .00402712 \cdot (LADA2-49.371) \\ & + .01677405 \cdot (LAGLD-6.542) - .00390145 \cdot (PURB70-68.886) \\ & + .00003453 \cdot (PURB702-5402.00) - .00195674 \cdot (LPDENSC2-24.892) \\ & + .01884267 \cdot (LPOPA-12.769) - .00562783 \cdot (TCCITYH-1.449)] \end{aligned} \quad (6)$$

3. Index of Administrator Costs [Table A-3 variables (71) through (75)]:

$$\begin{aligned} IADM = {} & 0.9936406995\ EXP[.04819551 \cdot (LADA-6.766) + .07917503 \cdot (LVALNHO-10.5) \\ & + .01459324 \cdot (LPOPA-12.769) - .0119334 \cdot (LPDENSA-4.734) \\ & - .01251203 \cdot (TCCITYH-1.449)] \end{aligned} \quad (7)$$

TABLE B-1

COMPUTER SYMBOLS AND MEAN VALUES FOR THE VARIABLES USED IN COMPUTATION OF THE COMPONENT AND OVERALL INDICES OF EDUCATIONAL COSTS[a]

Variable Name Used in Tables of Equations	Computer Symbol	Mean Value[c]	Standard Deviation
Names of Indices			
TEACHER COST INDEX	ITCH	1.000	0.057
PRINCIPAL COST INDEX	IPRN	1.000	0.131
ADMINISTRATOR COST INDEX	IADM	1.000	0.113
SECRETARIAL COST INDEX	ISE	1.000	0.088
CUSTODIAN COST INDEX	ICU	1.000	0.070
INSTR AIDE COST INDEX	IIA	1.000	0.079
NATURAL GAS COST INDEX	IGAS	1.000	0.725
ELECTRICITY COST INDEX	IELC	1.000	0.191
EDUCATIONAL COST INDEX	CEI	1.009	0.051
BUS DRIVER COST INDEX	IBD	1.002	0.063
TRANSPORTATION COST INDEX	ITRN	1.000	2.332
District Characteristics			
LOG_e (ADA)	LADA	6.766	1.897
$[LOG_e (ADA)]^2$	LADA2	49.371	25.715
$[LOG_e (ADAE)]^2$	LADAE2	48.911	25.101
PCT PROB PUPILS	PPROBPUP	1.230	1.450
LOG_e (PUPIL DENSITY, DISTRICT)	LSDENS	2.900	2.352
LOG_e (THEFTS, DISTRICT	LTHEFTB	4.014	0.439

TABLE B-1 (Continued)

Variable Name Used in Tables of Equations	Computer Symbol	Mean Value[c]	Standard Deviation
County & Regional Characteristics			
LOG_e (PRICE AGRI LAND/ACRE)	LAGLD	6.542	0.697
LOG_e (AVG PRICE NEW HOMES)	LVALNHO	10.500	0.237
PCT URBAN POP, COUNTY	PURB70	68.886	25.638
(PCT URBAN POP, COUNTY)^2	PURB702	5402.004	3193.331
LOG_e (POPULATION, COUNTY)	LPOPCO	12.476	1.590
[LOG_e (POPULATION, COUNTY)]^2	LPOPCO2	158.165	40.179
LOG_e (POP DENSITY, COUNTY)	LPDENSC	4.638	1.732
[LOG_e (POP DENSITY, COUNTY)]^2	LPDENSC2	24.507	16.852
LOG_e (POPULATION, AREA)	LPOPA	12.769	1.826
[LOG_e (POPULATION, AREA)]^2	LPOPA2	166.377	47.130
LOG_e (POP DENSITY, AREA)	LPDENSA	4.734	1.732
[LOG_e (POP DENSITY, AREA)]^2	LPDENSA2	25.407	16.734
HOURS FROM CENTRAL CITY	TCCITYH	1.449	1.552
(HOURS FROM CENTRAL CITY)^2	TCCITY2	4.507	7.972
LOG_e (AVG MAX TEMP, WINTER)	LWMXTEMP	4.130	0.107
Energy Variables (not appearing in Tables of Equations			
NATURAL GAS CONSUMPTION, 1976 (THERMS PER SQ FT PER YR)	CONSG76	0.473	0.311
ELECTRICITY CONSUMPTION, NORMALS[b] (THERMS PER SQ FT PER YR)	CONSENL	0.316	0.061
ANNUAL HEATING DEGREE DAYS (Actual figures, 1976)	DEGDAYS	2419.291	1200.090

TABLE B-1 (Continued)

Variable Name Used in Tables of Equations	Computer Symbol	Mean Value[c]	Standard Deviation
Energy Variables (not appearing in Tables of Equations			
ANNUAL COOLING DEGREE DAYS[b] (30-year normals)	ACDDN	1112.844	838.218
MARGINAL PRICE, NATURAL GAS ($ PER THERM)	MPGAS	0.210	0.018
MARGINAL PRICE, ELECTRICITY ($ PER THERM)	MPELC	0.041	0.0035

[a]The computer symbols used in this table are those used on the data sets developed for the purpose of this study of educational cost differences.

[b]Since no data were easily available on the actual cooling degree days for electricity consumption, data for the 30-year normals were substituted.

[c]Mean values of "uncontrollable" variables used in calculation of the transportation cost index are reported in Table A-8.

4. Index of Secretarial Costs [Table A-4, variables (4) through (9)]:

$$ISE = 0.9946290034\ EXP[.01201816 \cdot (PPROBPUP-1.23) + .17771548 \cdot (LVALNHO-10$$
$$-.0073835 \cdot (PURB70-68.886) + .00006774 \cdot (PURB702-5402.00)$$
$$+.04513132 \cdot (LPDENSC-4.638) - .00416562 \cdot (LPDENSC2-24.892)] \quad (8)$$

5. Index of Custodian Costs [Table A-5, variables (3) through (11)]:

$$ICU = 1.00020004\ EXP[.00975338 \cdot (PPROBPUP-1.23) + .14221157 \cdot (LVALNHO-10.5$$
$$-.00520597 \cdot (PURB70-68.886) + .00005513 \cdot (PURB702-5402.00)$$
$$+.15708248 \cdot (LPOPCO-12.476) -.00663821 \cdot (LPOPCO2-158.165)$$
$$-.05916649 \cdot (LPDENSC-4.638) + .00628742 \cdot (LPDENSC2-24.892)$$
$$-.29157995 \cdot (LWMXTEMP-4.13)] \quad (9)$$

6. Index of Instructional Aide Costs [Table A-6, variables (3) through (9)]:

$$IIA = .9969095803\ EXP[.00060191 \cdot (LADAE2-48.911) + .00833805 \cdot (PPROBPUP-1.$$
$$+.10113453 \cdot (LVALNHO-10.5) + .00000914 \cdot (PURB702-5402.00)$$
$$-.13242129 \cdot (LPOPCO-12.476) + .00397153 \cdot (LPOPCO2-158.165)$$
$$+.00134904 \cdot (LPOPA2-166.377)] \quad (10)$$

7. Index of Bus Driver Costs [Table A-7, variables (4) through (10)]:

$$IBD = EXP[-.10139044 \cdot (LADA-6.766) + .00580322 \cdot (LADA2-49.371)$$
$$+.0100693 \cdot (PPROBPUP-1.23) + .06069726 \cdot (LVALNHO-10.5)$$
$$-.00487502 \cdot (PURB70-68.886) + .00004579 \cdot (PURB702-5402.00)$$
$$-.01012342 \cdot (TCCITYH-1.449)] \quad (11)$$

8. Index of Transportation Costs [Table A-8, variables (10) through (16)]:

$$ITRN = .1955913705\ EXP[-.9284083 \cdot (LADA-7.1702) + .0143372 \cdot (LADA2-51.3123$$
$$+.87665545 \cdot (IBD-.991624) - .11017889 \cdot (LSDENS-2.899817)$$
$$+.11323766 \cdot (LTHEFTB-4.01394) - .00153349 \cdot (PURB70-71.057)$$
$$+.03357183 \cdot (LPDENSC-4.77197)] \quad (12)$$

In the calculation of transportation costs, we altered the coefficient on LADA to account for the fact that the index was computed on the basis of per pupil expenditures rather than total expenditures.

9. Index of the Costs of Natural Gas for heating and hot water:

$$IGAS = MPGAS \cdot [(k_{gas} \cdot DEGDAYS) + .0058]/.10106967 \quad (13)$$

k_{gas} = the therms per SQ FT per YR per Heating Degree Day necessary to achieve heating comfort levels.

10. Index of the Costs of Electricity for cooling, lighting and appliances:

$$IELC = MPELC \cdot [(k_{elc} \cdot ACDDN) + .238903975]/.01294128 \quad (14)$$

k_{elc} = the therms per SQ FT per YR per Cooling Degree Day necessary to achieve cooling comfort levels.

The denominators used in the computation of IGAS and IELC are the mean values of MPGAS · [(k_{gas} · DEGDAYS) + .0058] and MPELC · [(k_{elc} · ACDDN) + .238903975], respectively. For a more complete discussion of the determination of the values of k_{gas} and k_{elc} the reader is referred to the longer report referred in footnote (*).

The combination of the component indices into a single index involves essentially pricing out a given quantity of the various school inputs in each school district according to the component prices of school inputs adjusted for the differences in input characteristics and other factors that are within the control of the local district. This procedure is mathematically equivalent to weighting each index by the average proportion of a school district's budget spent on that component and then adding the individual weighted components together. A different weighting structure has been used according to district type: Unified, high school, and elementary districts. This different weighting structure is intended to reflect the potential differences in the educational products being produced in the three types of districts. The formula for the overall educational cost index, denoted CEI, for each type of district is set out below.

1. Unified Districts

$$CEI = (.564136 \cdot ITCH + .040238 \cdot IPRN + .015552 \cdot IADM + .047255 \cdot IIA + .081508 \cdot ICU + .094531 \cdot ISE + .00638 \cdot IGAS + .015125 \cdot IELC + .092454)/.957048 \quad (15)$$

2. High School Districts

$$IEDCOST = (.576218 \cdot ITCH + .022993 \cdot IPRN + .024794 \cdot IADM + .021934 \cdot IIA + .081778 \cdot ICU + .095668 \cdot ISE + .008695 \cdot IGAS + .017783 \cdot IELC + .097817)/.947391 \quad (16)$$

3. Elementary School Districts

$$IEDCOST = (.538665 \cdot ITCH + .027878 \cdot IPRN + .031554 \cdot IADM + .075293 \cdot IIA + .08155 \cdot ICU + .081794 \cdot ISE + .005555 \cdot IGAS + .016560 \cdot IELC + .089853)/.934869 \quad (17)$$

The denominators appearing in equations (15), (16), and (17) reflect the average proportion of unified, high school, and elementary school district budgets, respectively, allocated to all but transportation services. All budget proportions used in these equations are calculated including transportation expenditures. Since the transportation cost index is excluded from the computation of the overall cost index, the denominators used to compute the overall index is adjusted to reflect exclusion of the transportation index.